THE TEXTILE MANUFACTURER

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Notes of the Month

INDUSTRIAL FIBRES, 1959

WORLD production of the chief industrial fibres experienced on balance a moderate setback in the 1957-58 season, according to "Industrial Fibres" (H.M. Stationery Office, price 10s. 10d.) published by the Commonwealth Economic Committee. The reduction applied to each of the main natural fibres used for apparel and household purposes—wool, cotton and flax. On the other hand a further rise took place in jute, sisal and other hemps—while (in the calendar year 1957) man-made fibre output increased further. Total production in the free world during 1957-58 declined by some 2% from the previous season's peak, to an estimated 27,900 million lbs. However, output in Commonwealth countries showed little change in total from 1956-57, a 5% reduction in the wool clip being virtually balanced by larger production of cotton, jute and the non-cellulosic man-made fibres. Preliminary reports covering the 1958-59 season indicate that world output of fibres will be much the same as or possibly a shade higher than in the previous season. Wool production should be a shade larger than in 1957-58 and more substantial increases are expected for cotton and jute. On the other hand further reductions in flax and silk output are reported, while hemp may also decline slightly. Man-made fibre output fell during 1958, despite a further rise in the newer non-cellulosic fibres.

Estimated world consumption of the main apparel fibres rose to a new record in 1957, when it was about 1% higher than in the previous year. In all cases, however, the rate of usage showed a sharp fall in the second half of the year, and the decline persisted throughout 1958, when world textile industries were severely depressed. Following the setback in industrial activity, there was a general tendency for stocks of raw materials to rise, those of wool, jute and silk in producing countries being noticeably higher. Contrary to the general trend, cotton stocks fell for the second successive season, owing to the continuation of the United States Government's policy of reducing production, while at the same time disposing of its surplus holdings. Prices of nearly all the natural fibres were depressed during the latter half of 1957 and throughout 1958. Particularly marked reductions occurred in wool, long staple cotton, silk and flax. Sisal and manila hemp quotations showed relatively little movement, but jute prices fell quite sharply in the latter part of 1958.

Production. During 1957-58 the overall output of natural fibres in the free world fell by 4% but that of man-made fibres (calendar year 1957) increased 6% to an all-time record, and their share of aggregate production increased from 18 to over 19½%. The Commonwealth accounted for a slightly larger proportion of world output of cotton and non-cellulosic man-made fibres than in the previous season, but a smaller proportion of its wool, hard hemp and rayon production. Commonwealth countries produced most of the world's jute, although in recent years the quantities grown in China, Thailand and certain other countries have been increasing.

Among the chief apparel fibres, wool production during 1957-58 in the non-Communist world declined 4% compared with the previous season. The fall, confined to finer merino types, resulted from a reduction in the Australian and South African wool clips. Cotton production during the same season was 6% lower than in 1956-57; the reduction was mainly attributable to a small U.S. crop, where lower yields together with acreage restrictions brought about an 18% drop in output. Output of man-made fibres rose 6% during 1957 to a new peak, the total including an advance of 33% in nylon and the newer non-cellulosic types. Production of non-apparel fibres rose by about 1% over the previous season's total, chiefly as a result of a 2% increase in sisal and other hemps, while the world jute crop was marginally greater than in 1956-57.

Total production of industrial fibres in the free world (thousand million lbs.)

	Pre-war average	1953-54	1955-56	1956-57	1957-58
Cotton	11·6	14·5	14·7	14·3	13·4
Wool (clean basis)	1·8	2·2	2·3	2·5	2·4
Rayon and acetate:					
Fil. yarn	1·0	1·9	2·1	2·0	2·0
Staple fibre	0.4	1·7	2·2	2·5	2·6
Nylon and other man-made fibres	(a)	0·3	0·6	0·6	0·9
Silk	0·1	(a)	(a)	(a)	(a)
Flax	0·2	0·2	0·3	0·3	0·2
Hemp (incl. sisal)	1·9	2·1	2·2	2·2	2·3
Jute	3·3	2·8	4·0	4·0	4·1
Total	20·3	25·7	28·4	28·5	27·9
Man-made fibres as per cent. of total	6·9	15·3	17·1	18·0	19·6

(a) Less than 50 million lbs.

Prices.—During the second half of 1957 and throughout 1958 prices of virtually all natural fibres were depressed. Marked reductions occurred in wool, silk, long staple cotton and flax. A less pronounced fall occurred in medium staple (American type) cotton, while jute values remained relatively high until mid-1958. Prices of sisal and manila showed little movement in either direction, although sisal quotations were at a generally low level throughout the period. Manufacturers' quotations for rayon and acetate yarns in the U.K. have remained unchanged since January, 1957, although those of acetate staple were raised by about 10% in May, 1958. Wool values declined almost continuously after June, 1957, and by the close of the 1957-58 season prices of merino and crossbred wools were

each about 30% lower than a year previously. The downward trend continued into the 1958-59 season, with merino wools being more affected than crossbreds; the demand for the latter was generally steadier and the operation of the New Zealand Wool Commission's floor price scheme also assisted the crossbred market. The price of medium staple cotton continued to be governed by the United States Government's disposal programmes; a high degree of stability prevailed throughout 1957-58, but in the early months of the following season prices began to weaken. The downward trend in flax and silk quotations continued during 1958 due, in the former case, to further heavy sales of Soviet fibre at low prices and in the latter case to the virtual breakdown of the Japanese Government's raw silk price stabilisation scheme in mid-1958. While sisal prices showed little significant change from 1957, remaining at a relatively low level, those of jute declined quite sharply during 1958, in anticipation of a much increased crop in the current season; accordingly in October, 1958 the Pakistan Government reintroduced minimum export prices for raw jute.

U.K. price indices for selected industrial fibres
1947 = 100 (except flax: 1948 = 100)

Calendar Year	Wool	Cotton (American)	Silk	Flax	Sisal	Jute
1934-38 average	48	31	32	37	28	21
1953 "	261	155	160	131	124	98
1954 "	250	161	146	135	113	107
1955 "	225	155	136	128	107	102
1956 "	228	132	128	104	103	104
1957 "	257	124	126	97	95	119
1958 "	185	118	112	79	96	109
December, 1957	213	125	122	88	92	110
December, 1958	165	110	97	80	100	102

Trade.—The Commonwealth is an important supplier of industrial fibres to the rest of the world. The great bulk of the world's jute entering international trade is of Commonwealth origin, together with four-fifths of the wool, nearly two-fifths of the hemp, and about a tenth of the cotton and man-made fibres. The Commonwealth has a substantial net export balance in fibres, since its exports of wool, jute and hemp outweigh its imports of cotton, flax, rayon and silk. However, between 1956 and 1957, the overall export balance declined by about 12% due principally to smaller exports of jute and hemp and larger imports of cotton. The export balance in wool rose by nearly 50% between 1953 and 1957; in the latter year it amounted to 1,470 million lbs. and was 15% greater than in 1956 owing to a sharp increase in Australian exports. On the other hand net exports of raw jute declined by 9% to some 480,000 tons between 1956 and 1957, and those of hemp were 6% lower at 92,000 tons. Net imports of cotton showed a further rise in 1957, and at 875 million lbs. were nearly half as great again as in the previous year. This was primarily due to larger imports into the U.K. and India, coupled with a contraction in exports from Commonwealth sources. On the other hand imports of man-made fibres, at 112 million lbs. showed little change from 1956 and those of flax, which had risen sharply a year earlier, were only 4% higher at 50,000 tons.

A substantial proportion of the U.K. imports of wool, hemp, jute, coir and kapok are of Commonwealth origin, but a much smaller share of its cotton and mohair. About 85% of this country's wool supplies are normally drawn from the Commonwealth, about the same proportion of hard hemp and virtually all of its jute, coir and kapok. On the other hand Commonwealth countries supplied only 8% of U.K. cotton imports in 1957 against 18% in 1956. Compared with pre-war the Commonwealth's share in U.K. imports of wool, hemp and kapok has in each case increased, but for cotton and mohair it has declined.

A special section in the review describes changes in the position of the Six Common Market Countries of Western Europe as markets for Commonwealth fibres. Nearly the whole of Western Europe's supplies of raw jute normally come from Commonwealth sources, together with over 80% of its wool imports and about a third of its hemp. Western Europe's imports of Commonwealth wool have increased both absolutely and relatively in recent years and there has also been a marked rise in imports of Commonwealth hemp (sisal). By contrast, fairly small quantities of Commonwealth cotton are imported, and "the Six" are themselves substantial producers of man-made fibres and also jute manufactures, which are both protected by relatively high import duties.

New Fibres.—Production of the newer non-cellulosic man-made fibres continued to increase rapidly during 1957, and over the year as a whole there was a rise of about a third to 900 million lbs. The United States remained the largest single producer, followed by Japan and the U.K. Although nylon still constitutes the bulk of the total, its proportion has declined with the development of the newer polyester and acrylic fibres such as "Terylene," "Orlon" and "Acrilan." The capacity of the industry is being further expanded in all major producing countries so that by the end of 1959 it is scheduled in total to reach about 1,800 million lbs. or almost twice as great as actual output in 1957. (Later statistics show that production of man-made fibres in March this year was a little more than in March, 1958, while in the first quarter of this year production was 9% more than in the same months in 1958. The marked increase in output of staple in the last few months did not continue into March when production was 3% less than a year earlier.—*Ed.*)

LINEN INDUSTRY'S PROBLEMS

A CRITICAL assessment of the industry's present economic position and future outlook was made by Dr. W. Black, lecturer in economics at Queen's University, Belfast, in a recent lecture to local members of the Workers' Educational Association. Pointing out that the Irish linen industry today employed less than half the number of people it employed before the first world war, he said the output of cloth had fallen even more sharply. The decline had not been progressive, being punctuated by fluctuations in which recovery from depressions was only partial. It was sometimes suggested that what was true of linen was also true of cotton, but world production of cotton cloth today was about one and a half times what it was in 1913, while world production of linen cloth was now less than half what it was in 1913. The troubles of the cotton industry were due to a shift in the location of production. The decline of the linen industry was due to a severe fall in demand for linen cloth.

Dr. Black stated that while several reasons had been suggested for this change in demand the two basic causes seemed to be (*a*) the tremendous growth of new fabrics competing with linen and (*b*) the high cost of the latter. If linen had become cheaper during the period competition from other fabrics would not have been so severe. Evidence suggested that there was a long term tendency for linen to become more expensive relative to other fabrics.

Oil Burners for Mill Boiler Plant — 4

Application and layout of rotary oil burners with details of control methods and operational features. A description is given of low pressure air and steam jet systems of oil burning

By F. H. SLADE, A.M.I.MECH.E.

THE diagram Fig. 27 illustrates a typical application of a Hamworthy rotary oil burner. From this it will be observed that the burner motor, with a totally enclosed belt drive to the rotating cup, shaft and integrally mounted fan, is mounted on a cast iron furnace plate; hinged to permit inspection of the atomising cup when the burner is swung to the open position. The oil reservoir, on the right of the burner, embodies duplex fuel pumps for the circulating and atomising supply requirements; a viscosity or proportioning valve to balance the supply of oil between the atomising cup and the return line, dependent upon load demand, and a pressure equalising piston, compensating for unbalanced pressure conditions in the return system. The viscosity valve, by proportioning the fuel between the atomising cup and the return line under conditions of automatic or hand control, permits a turndown range of 3 : 1. A solenoid oil shut-off valve automatically closes the oil supply to the burner and prevents drips accumulating in the atomising cup.

An oil heater of the electric immersion type is integrally mounted under and parallel to the rotating shaft of the burner. This is complete with control thermostat and is arranged to raise by 40°F. the temperature only of the oil passing the cup prior to atomisation. Gas ignition equipment is provided, complete with H.T. spark electrodes and locally mounted H.T. transformer. Flame failure control is by photocell; the light sensitive element is fitted on the boiler front with cable connections to an amplifier unit in the control cabinet.

A steel windbox casing includes primary and secondary burner throat guards in firebrick, and a secondary air inlet damper designed to give linear flow characteristics when controlled automatically by the modulating motor. The latter, mounted above the burner, is arranged for 24 volt single-phase operation. Modulating the oil and primary and secondary air in relation to load requirements, it is complete with links and rods for interconnecting to the damper on the inlet ports of the primary shutter and to the viscosity or proportioning valve spindle.

The boiler or heater fittings include a limit switch, set for pressure or temperature as required to ensure that the burner is shut off at top limit; a modulating controller for pressure or temperature control as required, governing the impulses to the modulating motor in relation to the load to modulate the burner flame over a 3 : 1 range minimum; low water float switch to ensure burner shut down on extra low water and a micro-pressure draught switch to provide satisfactory draught conditions before the burner sequence commences.

Control

A control cabinet houses all the gear necessary to automatic operation of the burner. These include a sequence timer of the electric motor-driven cam type, with contacts to ensure the sequence of operation of the burner; photocell amplified, modulating motor

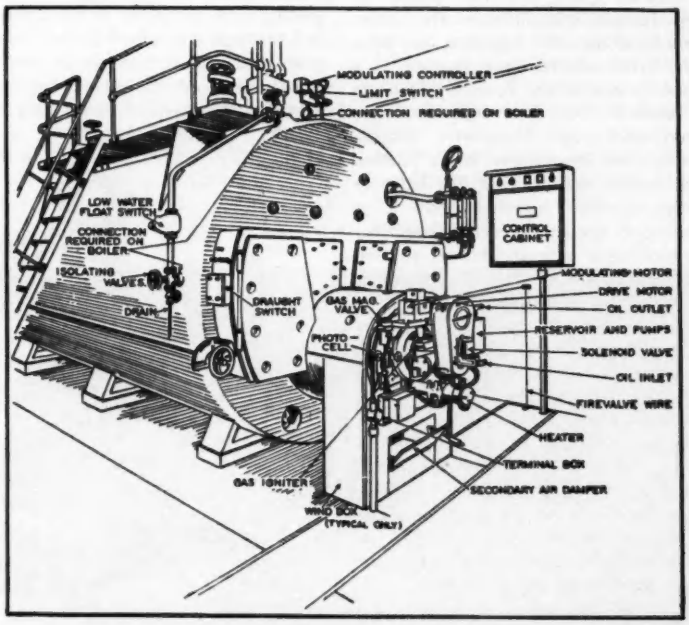


Fig. 27. Layout of typical application of rotary oil burner, showing control and other ancillary gear

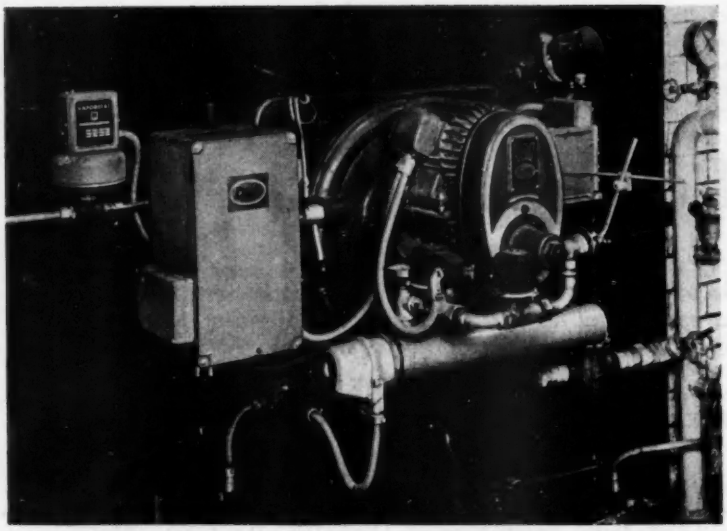


Fig. 28. The "Cero" rotary cup burner, now shown, is made in two sizes of 800,000/2,500,000 B.T.U's./hr. and 2,000,000/5,500,000 B.T.U's:/hr. minimum/maximum rates respectively

balancing relay; modulating motor transformer, 200 to 20 volt single-phase; low fire start relay, to ensure burner always light-up on low fire; burner motor contactor type starter; changeover switch for manual or automatic operation; manual rotary switch for adjustment of capacity when burner is under control; push-buttons for reset after burner is locked-out on fault; lamp indication, single only for burner lock-out indication; and fuses and terminal block.

The foregoing controls apply to single furnace installations only. Twin burners, controlled together, are provided with control gear housed in a double panel having basically two sets of controls, but only one sequence timer, and one changeover switch, manual reset switch and reset button. This makes certain that the burners always operate together, but it is possible to modify this arrangement by introducing a step controller, so that the burners fire in sequence, giving a possible 6 : 1 turn down.

To maintain constant furnace suction conditions on all boilers operating with mechanical induced draught a furnace pressure controller is recommended. This takes the form of either a second modulating motor identical with the burner modulating motor or a standard furnace pressure controller of the diaphragm type. The former is limited to single flue or single burner applications and the latter, for two or more burners.

Fig. 28 illustrates a rotary cup burner of Continental design. It is the Cero, manufactured by the Swedish concern, Maskinaktiebolaget Carat and marketed in this country by Felcoil Burners Ltd. There are two sizes of 800,000/2,500,000 BTUs'/hr., and 2,000,000/5,500,000 BTUs'/hr. minimum/maximum rating respectively; both designed for use with the heavier grades of oil up to 200 sec. viscosity Redwood No. 1. The burners are available for manual, semi-automatic or fully-automatic operation. With the first two forms of operation, ignition is by means of a torch, but when fully automatic electric-gas ignition is employed. With these burners, fuel is fed through a grooved hollow shaft to a spreader on the inside of a conical rotary cup. At this point, the fuel is evenly distributed as a thin film at the edge of the rotary cup and is thrown off as atomised vapour by centrifugal force. This is met by the draught stream and an intimate mixture of the air and oil produces a flame of true shape and direction.

The primary air necessary for atomisation of the fuel is created by a cast aluminium fan and the amount of air passing through the fan is regulated by an adjustable air damper. The annular space surrounding the edge of the rotating cup is provided with built-in guide vanes to give the primary air an even rotation in the opposite direction to that taken by the oil leaving the cup, thus producing a condition permitting complete and efficient combustion. The complete burner equipment is mounted on a heavy attachment plate and the working parts are hinged to permit inspection and cleaning. A locking device retains the burner in the firing position.

Automatic Package Boiler

In the first of these articles ("T.M.," November, p. 552) reference was made to the three-pass features of the "Steambloc" fully automatic package boiler. This is now illustrated in Fig. 29, a reproduced cut-away photograph which also shows the oil-firing equipment, i.e. a fully-modulated pressure-jet burner with gas-electric ignition and photo cell for flame failure shut-down. In the left foreground of the bed-plate is also shown the control cabinet. This embodies electronic and electro-mechanical devices ensuring safety in operation and providing for purging of the gas passes before starting-up, and total, immediate shut-down in the case of

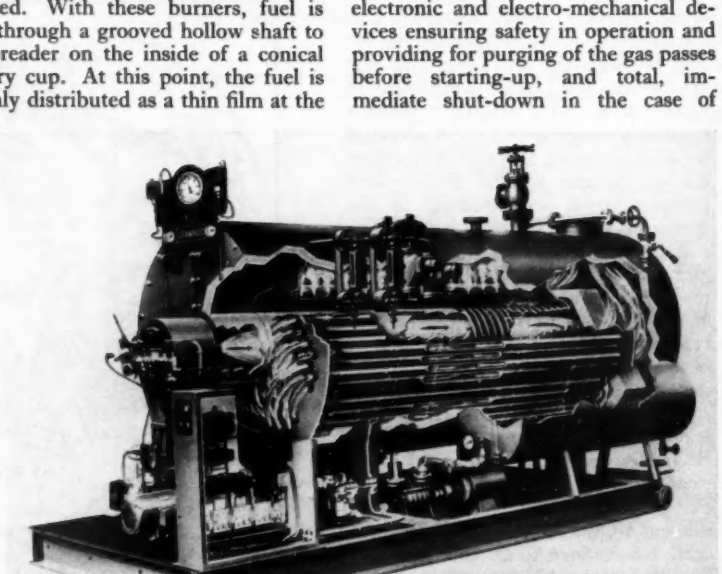


Fig. 29. This cut-away photograph illustrates the three gas passes incorporated in the "Steamblock" packaged boiler

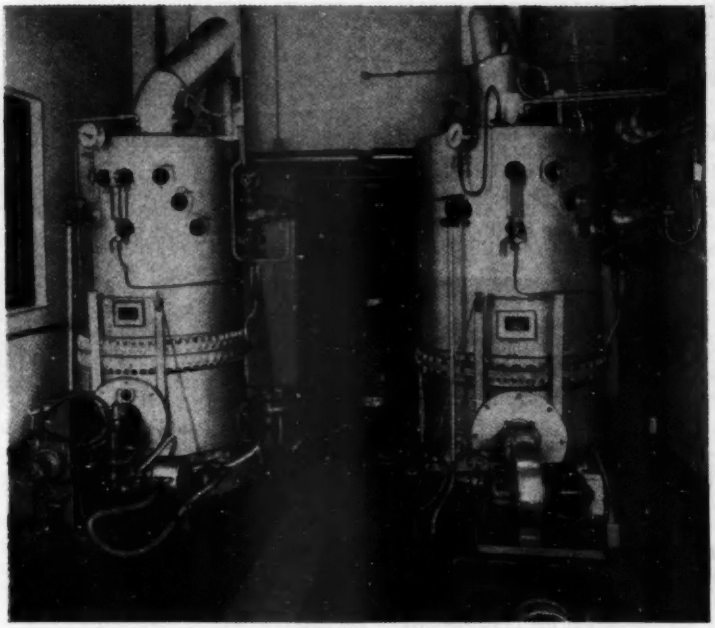


Fig. 30. Two Clarkson fully automatic thimble tube boiler units fitted with pressure jet

flame failure, low water or excessive steam pressure.

Other oil-fired packaged boilers produced by Spencer-Bonecourt-Clarkson Ltd., are shown in Fig. 30. The units illustrated are included in a range of water tube boilers, designed to give from 250 to 2,500 lbs. of steam/hour. The tubes, however, being of tapered construction and secured at one end only, materially deter scale deposition, and at the same time are free from troubles due to unequal expansion so frequently experienced with the cross-tube and smoke-tube types of boilers.

The boilers may be either fired by pressure-jet or medium air pressure burners. In the former case, the burner is fully automatic and is suitable for use with light oils up to 60 secs. viscosity Redwood No. 1, and evaporates up to 1,000 lbs./hour. Medium air pressure burners are arranged for either fully automatic or semi-automatic operation; with diesel oil fuel or with a fuel oil pre-heater for use with oil up to 220 sec. Redwood No. 1 viscosity at 100°F., or with special equipment up to 960 secs. viscosity fuel oil.

Attention should also be directed to the Wallsend-Hubbard low pressure air and the Wallsend-Howden steam jet systems of oil burning. The former is manufactured and marketed jointly by Wallsend Slipway and Engineering Co. Ltd., and Hubbard Ltd., and is now shown in Fig. 31 equipping boiler plant. The system can be supplied for hand control, high/low or modulating control and for most applications is suitable for burning the heaviest grades of fuel oil, including petroleum oils up to 3,500 secs. viscosity or home-produced tar oils, including C.T.F. 200.

The oil-firing front includes a multi-vane air director, with the aid of which the flame angle can be varied to suit the furnace tube diameter of the boilers. This is particularly valuable on boilers of the Economic, Lancashire and similar types, as it enables complete combustion to be obtained without any direct flame impingement and thus eliminates difficulties due to carbon deposits in the furnace tubes. The equipment includes a quick release oil coupling to facilitate withdrawal of the burner for cleaning and inspection and, when automatic control is used, the plant incorporates a combined automatic control and automatic shut-off valve.

The control valve is of the V-slot pattern with a micrometer adjustment for accurately setting the minimum air control in such a manner that the oil supply and the air for combustion are regulated in proportion, thus giving a practically constant air/oil ratio whether the boilers are operating at maximum output or under light load conditions. The arrangement, which is standard on all automatically controlled Wallsend-Hubbard installations, can also be incorporated in the hand-control plants. They can be arranged so that oil and the air from combustion are controlled from one lever, making it unnecessary to depend on the human element to obtain the correct air/oil ratio.

Steam Jet System

Fig. 32 gives a furnace front view of the Wallsend-Howden steam jet system of oil burning. The burner, mounted concentrically with an air distributor is designed to give a hollow conical spray, which sweeps uniformly across the whole circumference of the furnace, and in the air, distributor vanes are placed to cause the air to sweep across the oil spray and mix thoroughly with it, so that combustion is rapid and complete. As a result of its swirling action, the air catches up the fine particles of oil, forming a spiral flame, so that a high temperature is created early in the furnace and rapid transference of heat takes place; giving a steep temperature gradient and low chimney temperature. High efficiency, as shown by Table 2, is obviously the result of these conditions.

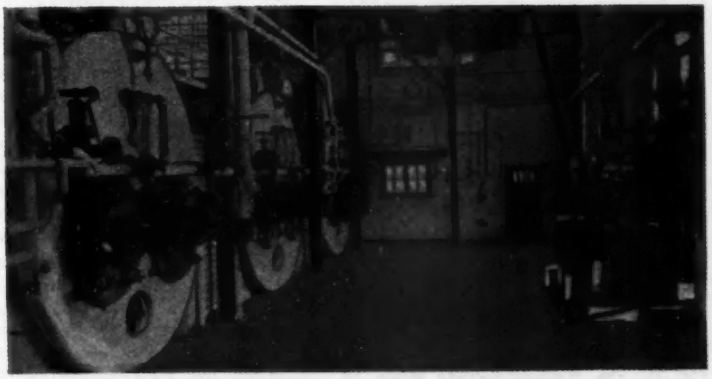


Fig. 31. Part of boiler plant fired by Wallsend-Howden power jet equipment. The pumping and heating unit is shown on right

Table 2. Test on Two Galloway Boilers (8 ft. dia. × 30 ft.) fitted Wallsend-Howden Steam Jet System of Oil Burning

Duration of test	4 hours
Total water evaporated	56,270 lbs.
Total oil burned	4,216 lbs.
Water evaporated per lb. of oil (actual)	13·3 lbs.
Equivalent evaporation per lb. of oil from and at 212°F.	16·1 lbs.
Average evaporation per hour each boiler	7,033 lbs.
Mean boiler pressure	313 lbs. p.s.i.
Temperature of feed entering economiser	92°F.
Temperature of feed leaving economiser	117°F.
Temperature of steam at 131 lbs. p.s.i.	365°F.
Average temperature of superheated steam	420°F.
Average degrees of superheat	64°F.
Calorific value of fuel	18,750 BTU
Overall efficiency of boiler plant	83·3%

Oil may be supplied to the burners by gravity or by a low-pressure circulating system and thus, the pumping and heating units required with the pressure system are not necessary. Furthermore, owing to the form of flame being the same as with the pressure system, its application is similar so far as furnace arrangements are concerned. Referring to Fig. 32, it will be observed that there are one oil and two steam connections to each burner.

The oil valve acts as a shut-off valve and also regulates the amount of oil passing to the burner. The steam connection at the back of the burner is for the atomising steam, which is controlled by the steam valve attached to the distributor. The other steam pipe is connected to the oil passage of the burner and is used for blowing steam through the burner to clean it without the necessity for dismantling. The outer tube or barrel of the burner can be moved backwards or forwards by means of the lever indicated, and by this means the maximum and minimum output of the equipment is regulated as well as the angle of the spray to suit furnaces of any diameter. To ensure free flow of oil from a gravity tank to the burners, the tank should be fitted with heating coils. If very viscous oils are to be used, it may be advisable to fit a line heater in the oil supply pipe; which should also be fitted with a strainer to prevent dust from interfering with the proper operation of the burners.

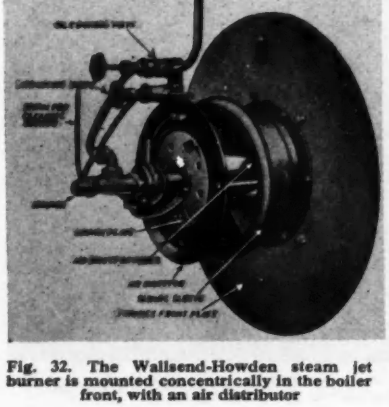


Fig. 32. The Wallsend-Howden steam jet burner is mounted concentrically in the boiler front, with an air distributor

Pressure Jet Burner

Doby Stokers Ltd. are responsible for the fully automatic pressure-jet burner illustrated in Fig. 33. It is the Model L.6, designed for burning distillate oils of up to 45 secs. Redwood No. 1 at 100°F. and is suitable for use with small and medium vertical steam boilers rated between 600,000 BTU's. and 1,250,000 BTU's./hr. The unit has a separate combustion head which is permanently bolted to the front plate of the boiler, the part of the head, as indicated in Fig. 33, being so arranged that it can be withdrawn in a matter of moments for servicing. Furthermore, the atomising unit may be removed without breaking oil or power lines, or air ducting. The oil pump, fan, electric driving motor and ancillary equipment are mounted on a heavy cast-iron baseplate; the whole being totally enclosed in a sheet steel cabinet providing protection to the equipment. Particular attention has also been accorded to providing controls for adjusting the burner while running, so that optimum combustion efficiency may be obtained.

The same concern has recently introduced a burner for use with medium fuel oil having a viscosity not exceeding 220 secs. Redwood No. 1 at 100°F. It is substantially the same as the Model L.6, but fitted with a pre-heater and recirculating system to ensure that hot oil is always available at the nozzle before the burner attempts to start. The pre-heater is a circular, flanged construction designed to work at 200 lbs. p.s.i. and is fitted with two 1 kW heating elements. It is arranged for removal as a complete unit and is adequately insulated to maintain the temperature of the oil within the heater for long periods.

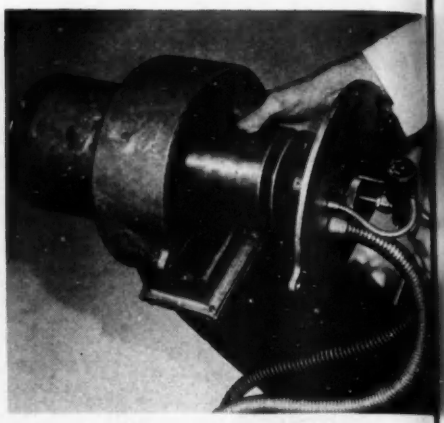
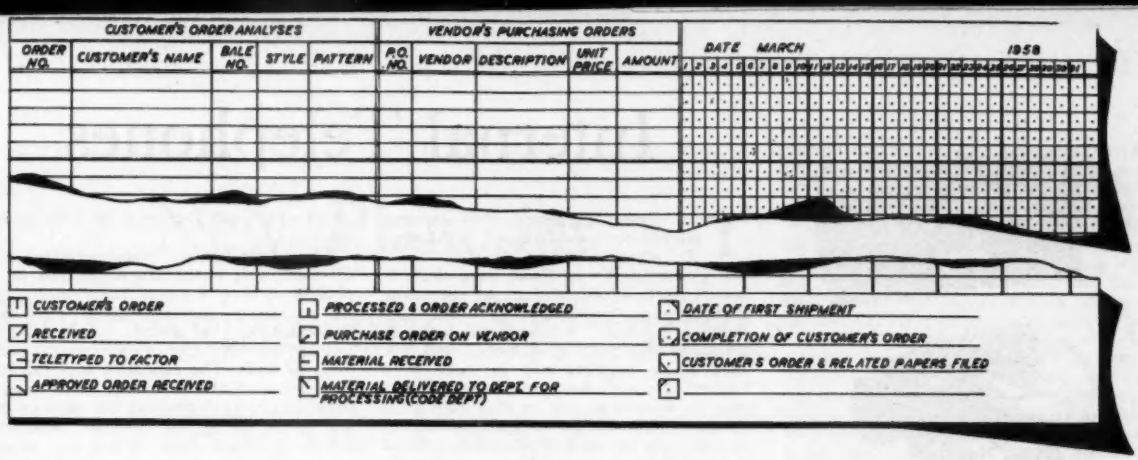


Fig. 33. Removing the combustion head of a Doby L burner for servicing purposes

The burner as before consists of two units and is arranged for rapid dismantling. The nozzle has a wide angle with good patternation characteristics working with an oil pressure of 180 lbs. p.s.i. and giving a fine, even and conical oil spray. In order to give a clear nozzle shut-off, a recirculating device incorporating a cut-off valve situated immediately behind the atomiser is used. This system gives the desired cut-off and also ensures that hot oil (at the preset temperature) is always at the atomiser head. The cut-off valve is actuated by a solenoid, electrically operated by an electronic time-delay to ensure that hot oil has reached the atomising head before the burner fires.

A rotary displacement pump, with hardened gears to withstand the physical properties of the fuel oil and incorporating a pressure regulating and a safety cut-off valve, delivers the fuel free of any pulsation. The pump may be used with a single feed pipe or, if preferred, may easily be adapted for two-pipe operation. Two filters are fitted—one hot and one cold. The cold filter is attached externally to the burner casing, at the suction side of the pump. The hot filter is fitted in the oil pre-heater on the pressure side of the pump. Both filters are metal edge type, and have internal mechanical cleaning arrangements operated manually from without the filter body.

Operation of the unit is fully automatic and it is ignited electrically. A pair of porcelain covered electrodes are mounted within the combustion head and fitted with shielded terminals and shielded cable to the transformer. The ignition transformer is continuously rated to give 10,000 volts output at 0·025 amps, when connected to an electrical supply of 230 volts single-phase, 50 cycle supply.



Processing Customers' Orders by Chart Method

By F. H. DREWES

A CHART available in "blank form" known as the Schlink progress chart is almost ideal for use in the textile industry for use in order analyses, or as a purchasing record, or for production or time studies, or a combination of any two or more related phases of work such as the processing of customers' orders and the purchase of raw materials necessary to expedite customers' orders.

The following is an outline or proposed method of follow through on the class of customers' orders on which it becomes necessary to await processing. This outline may also serve as a purchase record (or registes used as a history of the past, and actr as a guide in current buying). This form can also be prepared as a separate progress chart in processing customers' orders.

Suggested Combination of Customers' Order and Purchasing of Materials

First set up the progress chart in ordinary 3-ring 11 × 8½ ins. binder with one fold in the paper resulting, or set up in a larger 3-ring 11 × 17 ins. binder, then label the binder "Open Order and Purchase File." Next head progress chart by the date (month and year) and proceed to enter orders as received. Where a large number of orders are received and processed daily, it may be advisable to maintain a separate progress chart for each "active" letter of the alphabet or by customers ordering with frequency. However, the bale number assigned should run in one consecutive series, likewise the purchase orders placed on vendors should be assigned in consecutive order. The entering of orders in consecutive order line by line and page by page in the same month may prove difficult at a later date to locate without some searching, however, with certain information always available such as the bale number of customers' open order files, this difficulty should be minimised.

The white space at the left-hand side of the form has been used to incorporate the information shown pertinent to customers' orders. Vertical lines are used as guides, however, they do not overlap into the code section at the bottom of the chart. In other words, ruling is completed down to the code section and not through it. To the extreme left of the chart form it may be advisable to enter a "line number" for possible future cross-referencing.

The "work flow" by dates is entered opposite each entry on the same line using the symbols indicated at the foot of the chart and omitted from this paper to avoid repetition. The completed transactions are checked off in the last "box" or section on the right-hand side of the chart. Progress chart sheets should be retained in a current or active binder until the last of the 40-entries or lines on each page have been closed out—then transferred to an inactive binder indexed by months.

Begin each month with a new sheet or series of sheets. Recode if and when necessary to account for each and every movement of customers' orders from start to finish. The coding symbols are used "clockwise." Two or more symbols covering two or more transactions on the same date can be used or entered in the same date space to indicate handling of two or more phases of the order on the same date. Referring to the code symbol used to indicate date of first shipment on order—additional shipments other than final shipment and completion of order may be used with the same symbol and the number, such as *2 for second shipment, *3 for third shipment, and so on.

General Remarks

Provision has not been made for a separate section in the chart for dyehouse orders or instructions because of lack of "heading" space. This information can be handled in connection with progress charts for order analyses by one of two methods:—

(1) Enter dyehouse instructions on a second line covering the entry of customer's order utilising section headed "vendors' purchasing record." Incidentally, this section or caption may be changed to read "vendors' purchasing record and/or instructions to dyehouse. It is suggested that as many lines be used as necessary to properly account for all styles and patterns.

(2) Use a separate chart and cross-reference by sheet and line number with original entry of customer's order.

As a matter of record the Schlink progress chart costs from 5 to 8 cents each depending upon quantity purchased as compared with 22 cents each for paper only to photostat or reproduce this chart. Progress report charts should be subject to examination and review by management and other departments as affecting their "flow of work." This record should, therefore, be retained at a desk location in the office available for constant use.

Internal Telephones

The Speechmaster can be used with either six single-line telephones or five five-line telephones

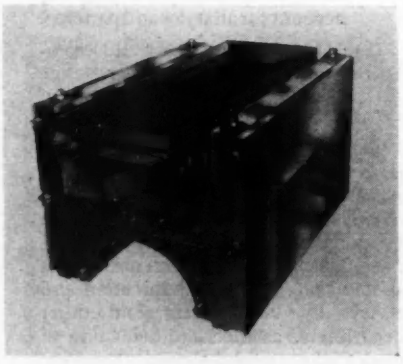
THE new "Adaptaphone" internal telephones manufactured by Modern Telephones (Great Britain) Ltd., 101 Tottenham Court Road, London, W.1. have been designed to meet the increasing demand for internal telephones that match efficiency in operation with an attractive modern appearance, and, as their name implies, may be used in a variety of ways. Five line Adaptaphones may be interconnected so that each is in direct communication with all the others, or they may be used with a transistorised master station when they are directly connected with it as well as each other. In each case calling is by simple push-button. The single line Adaptaphones are ideal for a simple two way system or up to six interconnected instruments. Calling is by push button buzzer on a code principle. They may also be used with the "Modern" Adaptaphone switchboard which will give up to 48 fully secret extensions.

The Adaptaphone Speechmaster can be used with either six single-line telephones or five five-line telephones. All are in direct communication with the Speechmaster by simple push button calling and five line phones with each other as well. The executive may use his Speechmaster to call any of these extensions simply by depressing the appropriate key and speaking, he does not need the handset which is there for use only when he requires privacy of incoming speech.

A call from an extension sounds a buzzer and a small "annunciator" pops out to indicate the origin of the call. The executive answers by flicking the appropriate key and speaking, but should he be out of his office the "annunciator" remains out so that when he returns he can see which extension has been calling.

Extracting Solids from Waste Water

IN manufacturing processes which produce quantities of waste water, the method of removing organic matter from the effluent for the purpose of complying with the Local Authorities's regulations on the subject of pollution by industrial effluents is creating something of a problem as these authorities gradually tighten up legislation in this respect. The usual systems of separation normally involve settling tanks, weirs or straining devices frequently wasteful of space, time and labour. An extremely efficient machine with a large variety of applications in industrial straining processes has, however, recently been adapted with great success to the extraction of solid matter from waste water. This is the Separator Mark III, made by Russell Constructions Ltd., 9 Adam Street, London, W.C.2, a unit which can strain out solids suspended in a liquid or viscous medium at high throughput rates. The effluent is fed to the screen through a specially designed nozzle which gives it a form of turbulence. The screen, to which a gyratory motion is imparted, is vibrating in such a manner that, while not itself rotating each point upon its surface is describing a circle of minute diameter in a horizontal plane at about 1,500 gyrations/min.



Russell Separator

This gyratory vibration eliminates any possibility of clogging or blinding of the mesh and causes the solid matter to be held in suspension while the liquid is being forced through. The de-watered solids travel with a rolling motion over the dry part of the mesh towards the outlet losing all the excess liquid they may be holding and are delivered at the opposite end to the liquid outlet. Throughputs as high as 15,000 galls./hr. can be obtained by this type of unit. The separator is a compact machine with a mesh area of only 7 sq. ft. The mesh, which can be as fine as 40,000 apertures/sq. in. is mounted in a frame rapidly detachable for re-meshing purposes. It is powered by a 1,450 r.p.m., ¾ h.p. totally enclosed motor of special watertight construction connected through a patent flexible coupling to an unbalanced flywheel which generates the gyratory motion. In spite of the force generated practically no vibration is transmitted to the body of the machine which is exceptionally silent in operation. In addition to the economy in removing suspended solids, a saving is frequently effected in that the water can be re-circulated through the plant, in some cases almost indefinitely.

Saxony and Cheviot Suitings

Reproduced approximately half size, linear, the attractive cloths on the facing page are patterns from the latest ranges manufactured by Walter Thorburn and Bros. Ltd., Damdale, Damcroft and Tweedside Mills, Peebles, Scotland. Brief details are as follows :—

(1) 96. An excellent example of colour balance in a fine Saxony suiting of 14 ozs. Natural yarns are beautifully blended with yarns in black, two tones of green, and light blue in a distinctive weave.

(2) 689. Extremely attractive double squared effect in a lightweight (9 ozs.) lambswool sports coating. The yarns employed are black, gold, white and medium grey.

(3) 175. A Cheviot thornproof suiting in a pleasant mingled squared effect of 16 ozs. Lustrous natural yarns are skilfully employed with grey, black and gold to give a smart, hard-wearing cloth.

(4) 691. Three colours—gold, black and brown—make this fine, lightweight lambswool sports coating of 8 - 9 ozs.

(5) 584. Again a fine sense of tone balance characterises this two-ply Saxony sports cloth. Three yarns—black, grey and natural—give this 16 ozs. cloth the right appeal.

(6) 703. A beautiful Saxony and worsted suiting of 17 - 18 ozs. Quietly checked and distinguished in appearance the dark yarns in brown, black, and green are effectively balanced by fine gold, royal blue and natural shades.

New Plant for Processing and Spinning Acrylic Fibres

MAINTAINING their tradition for progress and constant modernisation to meet changing conditions, S. Bourne and Co. Ltd., Weekday Cross, Nottingham, have completed the installation of a new plant for processing acrylic fibres on the worsted system. The firm started cotton doubling about 90 years ago and shortly afterwards moved to Britannia Mills, Netherfield, where the new plant is installed. In 1934, the company acquired Chadderton Mill, Oldham, converting it from a spinning mill to a modern doubling mill. Since then the programme of expansion and development has gone on continuously and today the firm's two mills are rated high among the most up-to-date in the industry, the Chadderton Mill being selected for the visit of the American Productivity Team in 1951.

Only a small proportion of specialist cotton production is now made at Netherfield. As it became evident that the importance of man-made fibres was rapidly increasing, the firm departed from traditional lines and about four years ago installed a plant for throwing continuous filament yarns, principally nylon and "Terylene." A special feature of this plant is a yarn sizing department in which the process is electronically controlled. Last year the company decided to enter another new field, the production of high-bulk acrylic yarns for the knitted outerwear trade, thus providing the unusual example of an old-established but progressive privately owned company developing from cotton doubling to nylon and "Terylene" throwing and now, worsted processing. In each of these developments the company has adapted its own "know-how," employed its own staff on the installations.

The central feature of the new plant is the Turbo-Stapler which gives the individual heat-stretched filaments a random break under localised stress and produces a sliver ideally suited to the manufacture of high bulk yarns, at a production rate of from 100 to 160 lbs. an hour depending on the total denier of tow used. The biased diagram gives long fibres to ensure yarn stability, and also a percentage of short fibres which supply the loft and cover to the yarns. All the tow is processed under identical conditions to ensure that subsequent shrinkage is absolutely uniform.

Many features on the Turbo-Stapler include safety guards of the company's own design. These consist of an elaborate system of perspex guards and wire grills with micro-switches which automatically stop the machine as soon as a guard is removed, thus providing complete safety to the operative. It has been found in practice that the perspex guards, although designed primarily for safety, also give a better control of the air-flow, lint dispersion and dust extraction.

The passage of the tow through the machine is illuminated by a light situated over the breaker bars. The machine also incorporates a device permitting any predetermined weight of sliver to be run into the can. This enables allowance to be made for the subsequent difference in length between the relaxed and unrelaxed components in later processing. Whilst this is not of great importance where large weights are concerned, with small lots one component would run out before the other if the relative lengths were not adjusted.

A proportion of the slivers from the Turbo-Stapler is relaxed in a Sanderson setter which processes, in five cans, 100 lbs. of sliver every 20 mins. steaming cycle; the machine, fitted with pre-set controls, works on a fully automatic cycle. In the event of further expansion the machine could cope with the output of three Turbo-Staplers. The cycle works on an alternating vacuum-steam-vacuum principle operated by a Negretti and Zambra control panel.

Unrelaxed sliver and relaxed sliver are then fed together to a Hood doubler where the first process of blending is carried out, normally in the proportion of 60% relaxed and 40% unrelaxed sliver. Since the length of the long fibres in the relaxed portion has been reduced from a 7½ - 8 ins. staple to 6 ins. staple, the unrelaxed portion of the blend is rebroken in this machine to give it the same maximum length. This process ensures a more uniform fibre diagram since all the fibres are nearer to the mean staple length thus contributing to the production of a more regular yarn.

Fibre lengths range down to 1 in., but the proportion of very short fibres is not very large since a lot of short fibres below 1 in. are removed by the dust extraction units. Eight ends of the blend from the Hood doubler are fed to a balling gill, which is a standard Bradford gill except for the triple front rollers, and the top roller, which has a covering specially designed for man-made fibres. Four tops are fed to the first pin-drafter, a Prince-Smith and Stells' "Speed-o-Gill," at which point blending with wool or other fibres could take place if desired. The machine is meant to supply a draft of 6 - 12 at a maximum speed of 1,000 faller drops/min., and delivers 2,500 ins./min. of sliver at a draft of eight. The machine is fitted with ionised air static eliminators and delivers into a large can containing up to about 40 lbs.

The second "Speed-o-Gill" is fitted with a Raper "Autoleveller" unit to ensure complete sliver uniformity, and automatically corrects on a range ± 15% giving a theoretical uniformity to within 1%. This also obviates the necessity for "balancing," i.e. grouping light and heavy cans.

The sliver then passes to a third "Speed-o-Gill" which has a single delivery head feeding two 16-in. cans, which then go to a Platt's MS2 high draft roving frame. The roving is spun on P.S.S. "Megaflex" 340-spindle spinning frames. Roving and spinning frames are both fitted with the "Versatex" drafting system, which provides the opportunity of either positive or slip drafting techniques. The latter method enables the full advantage of the long and short fibres produced by the Turbo-Stapler to be exploited. All the spinning frames are fitted with Meiner end-detection lights and "Pneumafil."

General view of a section of Bourne's new acrylic department, showing on the right the Turbo-Stapler, Sanderson setter and Hood doubler and, on the left, the gilling line

The Turbo-Stapler processing "Orlon" tow. On the left is a Sanderson automatic setter

Double-end spinning is employed for counts in the coarser range. For medium counts, a total production of about 60 lbs./hour is obtained, the standard range being 12s to 50s worsted counts, although a 71s yarn has been spun successfully.

From spinning the yarn goes for winding where it is given a light clearing from ring tube on to winders spool. It is then doubled and coned where it is given another light clearing, and from cones reeled on to 72-in. hanks for dyeing and finishing, which when relaxed give approximately a 54-in. hank. These are brought back to the department and wound on to cones on new Schweiter and Mettler machines specially designed for backwinding. Some of the yarn is coned on a Holt's M.86 coner fitted with the "Yarnspec" clearer (Wilson-Hollins patented yarn inspector), which employs a photoelectric cell principle. It can be set to allow the passage of a knot but not a slub, and as there is no contact with the yarn the possibility of abrasion damage is avoided.

Accurate control of each stage of processing is of vital importance in the production of high bulk acrylic yarns and to ensure this Bourne's have introduced a close quality control system. From the Turbo-Stapler, as well as regularity tests, staple length tests are taken at least once per shift, using the W.I.R.A. staple length tester. Steaming is a critical operation and temperatures should be kept to within $\pm$ 1°F., and the temperature inside each can is tested with a maximum reading thermometer. In addition, a shrinkage test is carried out on the sliver once per load. This is done by putting in a known length and testing the length after steaming. Regularity and staple length are again checked at the Hood doubler and the sliver weight is also checked. Sliver from the Bradford gill is checked for weight per unit length and for regularity on a Fielden-Walker evenness recorder and integrator. This check is taken on all three "Speed-o-Gills." A number of bobbins are slected from each doff of the spinning frames and checked for regularity, count, strength, twist, and boil-off shrinkage, and periodic visual checks are made on the blackboard.

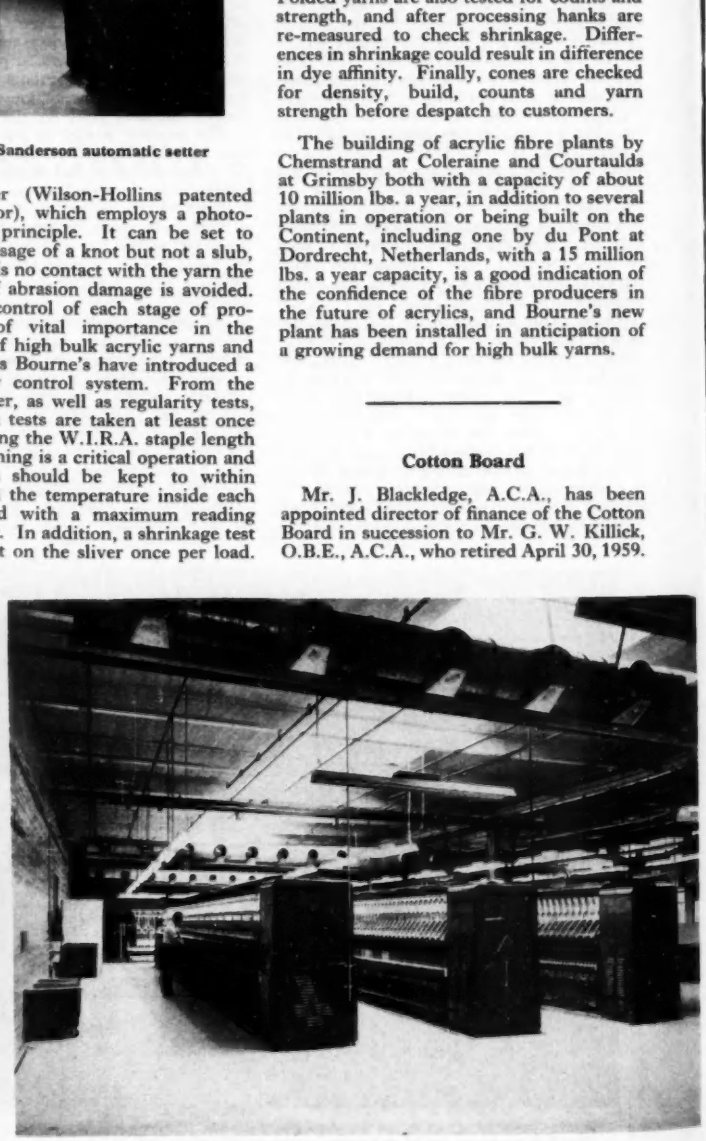
As mentioned, the yarn receives a light clearing from ring tube to winders spool. Twist tests are taken from plied yarn before commencing to double in bulk and the folded yarn is given a light clearing. After reeling, the circumference of hanks is checked before sending out to processors. Folded yarns are also tested for counts and strength, and after processing hanks are re-measured to check shrinkage. Differences in shrinkage could result in difference in dye affinity. Finally, cones are checked for density, build, counts and yarn strength before despatch to customers.

The building of acrylic fibre plants by Chemstrand at Coleraine and Courtaulds at Grimsby both with a capacity of about 10 million lbs. a year, in addition to several plants in operation or being built on the Continent, including one by du Pont at Dordrecht, Netherlands, with a 15 million lbs. a year capacity, is a good indication of the confidence of the fibre producers in the future of acrylics, and Bourne's new plant has been installed in anticipation of a growing demand for high bulk yarns.

Cotton Board

Mr. J. Blackledge, A.C.A., has been appointed director of finance of the Cotton Board in succession to Mr. G. W. Killick, O.B.E., A.C.A., who retired April 30, 1959.

Mr. M. F. Ward (general manager), Mr. H. Finley (manager, acrylic department), and Mr. A. O'Malley (technical director) examining the tow entering the Turbo-Stapler feeding zone



General view of spinning section showing three "Megaflex" spinning frames

Blending, Spinning and Dyeing Nylon for Carpets*

NYLON has certain properties which make it a good carpet yarn. These are:—

(1) High abrasion resistance, giving a long wear life.
(2) High recovery from deformation.
(3) High surface cover.
(4) Good resistance to soiling.
(5) Mothproof.

British Nylon Spinners have been carrying out development work to find the best method of using nylon in carpets. For this work, a pilot tufting plant was installed. Tufting machinery was chosen because it was considered to be the most convenient method of producing small samples for experimental trials. Laboratory equipment was also designed to assess the probable performance of all types of carpets in use. More recently, B.N.S. have co-operated with manufacturers of conventional carpets in the production and testing of all types of carpets. In this report the manufacture, dyeing and finishing, properties and appearance of carpets containing nylon are considered in detail.

B.N.S. recommend the use of 18 den. nylon staple for all carpet yarns, either medium crimp heat set staple or medium crimp normal (non-heat set) staple. When different surface effects are required in the finished carpet, non-heat set fibres offer the greatest possibilities. Yarn produced from this fibre can be heat set to produce frieze effect and curly pile. Usually, a folded, high twisted yarn is used to produce these effects.

A given weight of heat set fibre gives better cover than the same weight of non-heat set fibre, and can be used alone when surface effects are not required. With heat set fibre, the best results are obtained by using singles yarn with minimum processing twist (twist factor 3·0).

Blending.—Nylon fibres of 18 den. can be blended with any of the known carpet fibres to produce a satisfactory carpet yarn. In order to obtain the advantages offered by nylon in carpet pile, sufficient nylon must be present in the blend. For example, the minimum nylon content in a blend with viscose rayon should be 50%, while for wool and acrylic fibres at least 30% is required.

Nylon staple is available in different staple lengths to suit the various carpet yarn spinning systems. Work to date has been done with yarn spun on the cotton system, but this is not intended to imply that other systems will not give equivalent, or better, results for certain effects and end-uses.

Production.—No running difficulties should be encountered with yarn spun from nylon; where necessary in tufted carpet processing yarn joins can be made with latex. Over tensioning of the yarn should be avoided; the high strength of nylon should not encourage operators to apply excessive tension which can cause undue wear at points of contact. This same high strength of nylon prevents fibre breakage during manufacture and thus reduces fly and fluffing.

Some modification of present cutting methods on all types of machinery may be necessary to obtain a satisfactory performance with nylon. On the B.N.S. experimental tufting plant careful setting has given satisfactory cutting results. It is advisable to use special blades designed for nylon on shearing machines. These will give a longer life for continuous running although ordinary blades are satisfactory for short runs, but will need more frequent sharpening. No difficulties have been encountered in backing these carpets. Rubber latex has been used, but the use of other backing solutions will also be investigated.

Dyeing and Finishing

For carpets the dyes should be fast to light, rubbing and wet shampooing. Thus, selected neutral-dyeing acid milling dyes and premetallised dyes are preferred to disperse dyes. For heavy shades of navy blue, bottle green, wine and nigger brown, chrome dyes are often used.

Nylon staple fibre can be dyed in Obermaier or Longclose-type loose stock dyeing machines fitted with stainless steel cages. During dyeing, the liquor is pumped through the mass of fibres and alternate two-way flow is commonly adopted. The machines should not be overloaded with fibre and dyeing should be carried out at the boil.

After dyeing, lubricating agents with anti-static properties should be added to the fibre to promote ease of carding and freedom from static effects at the opening and carding machines.

Yarn Dyeing.—In common with wool yarns, nylon carpet yarns can be dyed in hank form on conventional equipment. Prior to dyeing, a scour in soap (or synthetic detergent) and soda ash is recommended to ensure a thorough cleansing of the fibre and to promote levelness of shade.

Since fast dyes are recommended, close attention must be paid to loading dyebath pH (acidity or alkalinity) and rate of temperature rise. As with loose stock, the addition of an anti-static dressing is advised to facilitate subsequent processing.

Piece Dyeing.—Most piece dyed nylon tufted carpets are dyed before the latex backing is applied. One of the advantages of piece dyeing nylon carpeting is flexibility of shade. Added to this is the advantage of lower stocks of coloured yarn. However, levelness is a problem when using fast dyes in pale to medium depth colours and shading from side to centre is a difficulty encountered in the piece dyeing of wide carpets. Aids to overcome the problem include:—

(1) Ensuring a good circulation of dye liquor.
(2) Ensuring uniform temperature throughout the dyebath. This is assisted by a uniform distribution of heating coils in the liquor.
(3) Running the winch at a speed fast enough to ensure rapid movement of the carpet through the liquor.

After dyeing, a slow cooling rinse is given, and the carpets are hydro-extracted at open width, and then hot-air dried.

Carpet Properties

From trials on a busy staircase, it was found that a 100% nylon tufted carpet wears approximately three times as long as a similarly constructed wool carpet, and twelve times as long as a similarly constructed viscose rayon carpet. Because of its good wear life, nylon pile heights can be lower than other fibres, but reducing tufted density below normal standards is not recommended.

Both wool and nylon have high recovery from short and long time indentations, e.g. footsteps and heavy furniture respectively. The recovery properties of wool and nylon are superior to those of viscose rayon.

Soiling and Cleaning.—Carpets made from nylon have good resistance to soiling, probably because nylon has a smooth, circular cross-section which will not hold soil particles. Successful cleaning can be carried out using a normal household detergent for *in situ* cleaning, or for wet cleaning on a commercial basis. Tufted carpets should not be dry cleaned as the solvents used may partially or completely destroy the latex backing material. Woven carpets, which do not have latex backings and are produced from 100% nylon can be dry cleaned successfully.

Handle and Appearance.—Carpets made from nylon, particularly heat set fibre, have a pleasant, springy handle. One hundred per cent. nylon, or nylon blended carpets, have similar patterning scope to other carpet fibres. Nylon bulked yarns, high twist yarns and combinations of heat set and non-heat set fibres can be used to advantage to give attractive and novel surface textures which are not easily obtained with other fibres. Interesting effects of combining heat set and non-heat set fibre can be enhanced by piece dyeing because of the difference in dye uptake of the two fibres. There is little fluffing with new nylon carpets and vacuum cleaners can be used immediately after the carpet has been laid.

* *With acknowledgements to Textile Development Dept., British Nylon Spinners Ltd.*

China Buying More Greasy Wool

A sharp rise in Communist China's purchases of Australian greasy wool is reported by Australian wool brokers in Sydney, who say that in current sales China is buying three to four times as much greasy wool as last year. At the same time, China is continuing heavy buying of soft and scoured wool which, in the past, has made up the bulk of its wool purchases from Australia. One Sydney buyer and broker said China's first large-scale entry into the greasy wool market followed the programme by the Peking government to establish new scouring plants, and a visit to Australia by a team of Chinese wool and textile experts. Heavy purchases of greasy wool are expected to lift the value of China's total imports of Australian wool this year to well over last year's figure of £6,400,000.

Modern Techniques in Carpet Manufacture

Over 200 delegates attended a recent conference organised by the Kidderminster and District Section of the Textile Institute. Abstracts from the papers appear on this and succeeding pages

New Techniques in Wilton Carpet Manufacture

I DO not subscribe for one minute to the view that American manufacturers or indeed, loom makers, are in any way superior to our own. On Wilton and velvet weaving, however, they have shown a different approach and today, in North America the production of this type of carpet is greater than it ever has been. It is largely, however, concentrated on one-, two- and three-frame carpets either in all wool or blended or all synthetic and around 216 pitch or less. Much progress has been made on weaves which are not orthodox Wilton but which are made on a standard or modified Wilton loom, said Mr. I. S. Porter, B.Sc. (director, Wilson and Longbottom Ltd., Barnsley).

Since 1945 developments and influences had been:—

(1) There had been a change in widths from body carpet of 27 ins. to broadloom up to 18 ft.

(2) The first challenge had been made to the orthodox Wilton loom for over 50 years in the acceptance of the double shuttle loom.

(3) Considerable increases have been made into the speeds of wire looms bringing them up, on certain qualities, to 145 p.p.m. giving 72½ rows of pile per minute. Efforts had been made to correlate the two types of loom and, on certain models, complete convertibility could be achieved whereas on other models standardisation of many of the parts could be achieved although certain fundamental centres were changed. New mechanical motions on wire looms were that single beat looms were now finding general favour as opposed to double beat looms.

Wire motions had been radically improved. On looms up to 8/4 and 2 metres, an epicyclic motion had been widely used which gave a reciprocating action from a purely rotary action. This had enabled very high speeds to be obtained and the actual dwell, required in traversing the slide from inserting a wire to bringing it to the front to collect a wire for withdrawal, was obtained not by the use of cams and eccentric gears but by withdrawing a wire approximately 2 ins. further than was necessary and thus one got 4 ins. of wasted movement which in effect, gave a dwell. With this type of motion, speeds of 145 p.p.m. were obtained on 3/4 plain looms and 125 p.p.m. on 5-frame jacquard looms. "We have actually woven 3/4-in. cut pile working at 155 p.p.m.," said Mr. Porter.

Beam sizes of up to 30 ins. dia. were now common together with cop sizes of 16 and 18 ins. long. Stop motions were provided to cover practically all eventualities including breakage of the pile warp both to stop the loom in the event of a faulty insertion of a wire or the breakage of a wire head. Feeler motions could be provided to stop the loom before the shuttle was nearly exhausted and all these motions went into a central control panel. Undoubtedly, with certain types of yarns, it was possible to run more than one loom per weaver.

Wire loom weaves had influenced loom designers as apart from the well-known 2- and 3-shot wire loom weaves, other weaves were being used and were in the course of development. Spoon wires and serrated wires were used with certain sculptured effects. Float weaves were being developed with the use of three-position jacquards so that they could obtain an orthodox pile weave to intersperse this with a form of tapestry weave. Two wires on one head could be used to give two varying heights of pile on the same shed. It was possible that future weave developments taking place in the moquette trade would come to the carpet trade.

The principle of double shuttle weaving was not new, of course, having been used in the velvet and plush trades for many years. Single shuttle looms had also been in use for carpets for a considerable period but were primarily concerned with single shot weaves and had the disadvantage that no proper selvedge could be woven. Whilst some manufacturers were trying to produce the same qualities on double shuttle looms as wire looms, Mr. Porter suggested that much greater benefit could be obtained by having a separate range of qualities for the double shuttle loom because they undoubtedly benefited from a good yarn in order to get high efficiencies; it would be appreciated that although there was no more pile yarn in a double shuttle loom than on a wire loom, when an end did break, it effectively stopped the production of two carpets instead of one.

The levelness of cutting was generally considered much superior to that on a wire loom and an incidental point was that the maintenance costs for cutting were, of course, considerably lower than a set of wires. Plain double shuttle looms were now being set up in North America in what were previously 100% tufting plants. These looms were being set up to produce cut pile carpets as it was felt that the tufting machines were more suitable for the looped pile construction. The inherent advantage of the double shuttle loom was that on jacquard weaving, there was a 50% saving in the dead pile yarn. Because of this,

l. to r., G. H. Yates (sales manager, Platt Bros. (Sales) Ltd.), I. S. Porter (director, Wilson and Longbottom Ltd., Barnsley), C. F. Ward (chief chemist, W. E. Saxby (Nottingham) Ltd.) and Dr. P. P. Townend (senior lecturer in Woollen and Worsted Yarn Production, University of Leeds)

allied with its high production—3/4 double shuttle looms were running at 100 p.p.m. giving an effective 200 p.p.m. or 100 rows of pile per minute on a 2-shot weave—the Wilton had become very competitive. Mechanically, there had been considerable developments in the construction of the loom, particularly on broad widths up to 20/4. Picking motions could now be fitted, either of the spring pick or mechanical pick type which did not operate when the loom reversed. Attention had been paid to beam loading, particularly in respect of the inside bottom beam.

I feel we are embarking on a very interesting era, said Mr. Porter, particularly in connection with weaves for the double shuttle loom. Many people now accept the principle that the loom will produce basic carpets and we now have to exploit the advantages that mechanism gives us which cannot be found on any other form of weaving machine. Apart from the standard weaves, I would mention the following:—

(1) One-shot plain weaves have been produced with a very high rate of production although it is generally accepted that it is necessary to apply a backing material to them.

(2) Two-shot weaves with the design woven right through to the back pick are being woven and also three-shot weaves for very high class carpets and, in fact, my own firm are supplying looms to Baghdad for this purpose.

(3) Interesting, very high pile weaves for rugs are being being used with either a V or W bind for the pile.

(4) Loomed pile weaves can be woven double shuttle although it is not possible to obtain a perfect selvedge but it does give a very attractive carpet.

(5) Weaves with all the dead yarn in one carpet and no dead yarn in the other carpet are being used for contract work so that the top quality can be used in the halls and the cheaper quality in the bedrooms but both of identical design.

(6) Scope is rapidly increasing and other interesting weaves are under development.

Development in Gripper and Other Carpet Looms

WHEN Mr. W. Felton (director, David Crabtree and Son Ltd.) addressed the conference on developments in gripper and axminster carpet looms, he said that the company had also recently developed a new machine for making plain carpet on a pre-woven jute backing. Dealing first with the recent improvements on the gripper loom he pointed out that, apart from minor mechanical modifications, the most important improvements were first, all-electric control. Unless otherwise specified all Crabtree looms were now fitted with high torque motors and magnetic brake with push-button start-and-stop, and inch forward and reverse buttons, and this had proved much better than the old clutch drive.

The second improvement was the rotary warp beam. It had always been the custom to mount the warp beams in the bearings in the loom ends. The gripper and spool gripper looms had three warp beams. It was a long and laborious job to change the front or middle beams, especially the front one as it was necessary to lift out the two back beams to take the front one out and put a full one in its place. To simplify this they had mounted all three beams on a rotor which rotated on a common centre in bearings in the loom ends. The rotor was hand operated through a worm and worm wheel gear so that any of the three beams could be brought to the back of the loom where it could be replaced with a full beam without effort and the rotor was then turned to bring all the three beams to their working position.

The warp let-off mechanism was driven by chain from the lay shaft and was arranged at the side of the loom. It was easy to get at and should anything go wrong and the jumbold rose too high the loom would stop automatically. The chain drove a crank and this was connected to three pawl levers which worked three ratchets—one for each beam let-off. Each jumbold was connected to a seroud on its respective ratchet and as a jumbold rose more of the ratchet teeth were exposed and the pawl took up more teeth and, of course, as the jumbold fell less teeth were exposed and so it gave out less.

The spindle on which the ratchet wheels were mounted goes through the loom end and each connected through bevels to worm shafts which drive the worm wheels for each beam. The worm wheels were mounted in the loom end and had a square hole in the centre. The beam shaft had also a square recess in the end. A square plug was pushed through the worm wheel and into the square recess in the end of the beam shaft, thus making a positive connection. When a beam had to be changed, the three plugs were withdrawn, and the whole assembly was free to rotate.

Messrs. Hardakers had developed a new 12-frame jacquard and Crabtrees had fitted this to their 3/4, 12/4 and 16/4 looms, said Mr. Felton. The principle of the jacquard was very good. It was on the lines of the Verdol system, but unlike the Verdol there were no needle springs. It was positive in action and it was not possible for a needle to give a wrong selection. Another big advantage was that the whole needle box could be taken out very quickly and replaced with a spare needle box and any bent needles could be replaced on the bench. When a 12-colour jacquard was used it was necessary to give serious thought to the creels. They had to accommodate 50% more cheeses or bobbins and Mr. Felton strongly advised going higher with the creels, i.e., 24 bobbins against 16 bobbins high for 8 frames rather than increase the length of the creels. If the creels were too long the ends became congested and the yarn snarled up at the back of the guides in front of the creels.

Regarding the spool gripper loom, they had recently built four 16/4 spool gripper looms and these had been fitted with an entirely new type of spool chain. Compared with the orthodox spool chain this at first looked fantastic, but taking into consideration the work it had to do it was not so. It was a 4 ins. pitch Renold conveyor chain with special links provided with lugs which engaged in a slot in the spool frame end bracket. The spool frame was secured to the chain by a spring plunger on the spool frame which passed through the sides of the slot in the spool frame and bracket and through a hole in the spool chain lug. It was, therefore, securely attached to the chain and it was virtually impossible for the spool frame to fall out of the chain. The advantages of this chain were:—

(1) It was of robust construction and would not stretch.

(2) No top wheels were required on the gantry as the chain rolled on its own rollers on angle sectioned rails on top of the gantry.

l. to r., C. S. Newton, M.B.E. (director, Carpet Trades Ltd.), R. G. Head (Carpet Manufacturing Co. Ltd., and chairman of the Kidderminster and District Section of the Textile Institute), W. Felton (director, David Crabtree and Sons Ltd., Bradford), G. Robinson (head chemist, Carpet Trades Ltd. and vice-chairman of the Kidderminster and District Section of the Textile Institute)

(3) The chain wheels were plain long pitch roller chain wheels, extremely strong, and would last for many years.
(4) It could be guided in channels to prevent sway. This was specially advantageous on the front of the loom.
(5) The spool frames were rigidly fixed in the chain and as the frames passed over the chain wheels from one side to the other they did not flap over, and so avoided short rows through the ends being disturbed in the comb.

Manufacture of Woollen Yarns for Carpets

THE present position would seem to be that yarn spinners tended to process in the greasy state whereas manufacturers tended to process in the scoured (and dyed state), stated Dr. P. P. Townend, B.Sc., F.T.I. (University of Leeds). Greasy wools, he said, tended to be condensed on double doffers whereas scoured materials tended to be condensed on tape condensers. Scoured materials could be carded at much higher rates and machine stoppages for fettling were very much reduced. The trend in the use of man-made fibres in carpet blends would seem to favour the processing of scoured blends. Furthermore, greasy wools although shaken prior to carding, must carry a fair proportion of dirt and it had been shown the governing factors in the build-up on swift teeth were dirt and oil.

Discussing machine design Dr. Townend said that for carpet wools or blends of wool and synthetics, the size of the card, i.e. the number of carding points was governed by the wool component and the less this was the smaller could be the card. In the 100% man-made fibre blends for coarse deniers the card needed to be a 1-swift scribbler and 1-swift carder if it was to be made on the woollen principle—but it would seem that the trend would be 100% man-made fibre blends to be processed on modified cotton or flax systems; and it might appear that if carpets be made wholly from man-made fibres then the present conventional system of woollen condensing and spinning would cease to operate.

However, assuming wool was still to be used for carpets, what was the trend in carding machines? Assuming scoured wool/synthetic blends one could summarise the position as 2 part scribbler—"Peralta"—centre draw and scotch feed—single part carder preceded by a 30 ins. breast and tape condenser, and single rubber or six height where the gauge of the ringframe required this arrangement. Recent research in carding and its application to carpet yarn production, indicated the increasing use of diamond point wire. The density of card clothing did not materially affect better carding.

Spinning

Dr. Townend said so far as he could see the ringframe was likely to oust the mule as a spinning machine for the production of carpet yarns, for the following reasons:—
(1) The low draft normally given to carpet yarns.
(2) The increased rate of production.
(3) The much larger package.
(4) The reduction in machine stoppages because of large packages.
(5) The variable twist inserted in mule spun yarns due to the yarn between nip of spool and delivery roller being twisted again.
(6) The variation in count of mule spun yarn due to sloughing-off in thick counts.

Considering frame spinning it was interesting to ask where did draft take place (this varied with the amount of draft). How was twist distributed in the drafting zone? What are the functions of the notches, jaws and tub?

It is evident, said Dr. Townend, that notches were simply distributors of twist and such could be dispensed with if the drafting line between back and front rollers were straight, as in the Reiter frame; this was a desirable feature of any frame, he continued. Furthermore, the present system of front roller arrangement whether it be 2- or 3-roller nip was undesirable. It was mechanically unsound to have to obtain a nip in the horizontal plane. He would much rather have a roller system as used in worsted spinning where either dead weighting, lever or spring loading was possible. He was not convinced that on long fibre blends such as in carpets that one need have such small front rollers. If these could be larger they would add to the increased efficiency of the frame, he said.

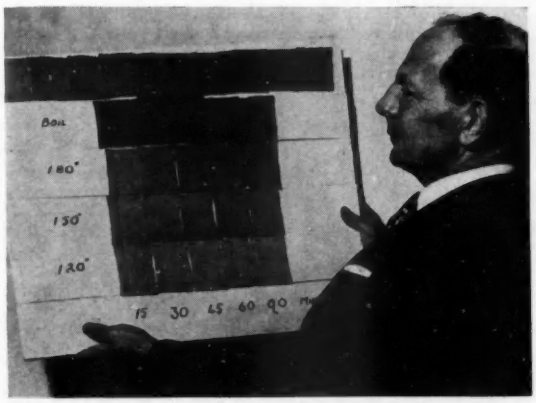
It had been suggested that in wool spinning there is migration of the shorter fibres to the surface when both sets of fibres are the same denier, and the thicker went to the outside when they were of the same length. In woollen spinning, however, it was difficult to prove migration in spinning. There was a possible migration in all-"Fibro" blends, where the fibres might be straighter and less tangled and, of course, this might operate in carpet blends where fibres were again straight and thick but in all-wool or wool/"Fibro" blends it was difficult to prove any separation in spinning.

Dr. Townend noted that the card was at present limited by:—
(1) A hopper which would weigh uniformly at greater rates than say 200 lb./hr.
(2) By the ability of the condenser to rub this weight of slubbing.
(3) By the problem of doffing the condenser bobbins at these high productions.

It seemed that increased productions from the card would only follow if one could substitute some other method of inserting cohesion into condensed slubbings other than by rubbers which were extremely inefficient so far as work done is concerned. Was it possible to do away with rubbers at the card and simply wind on to cheese which could then be transferred to spinning? There seemed little advantage in large package spinning if the package from which one was spinning was smaller than the package on to which one was winding. If cans could be used to take up the condensed slubbings and the frame could be singled sided it should be possible to increase the efficiency of the spinning process by some 10 - 20%, concluded Dr. Townend.

Dyeing Wool and Mixture Yarns

A SIMPLE method of studying the relationship between rate of dyeing, time, temperature and any other desired condition, was evolved in the laboratories of W. E. Saxby (Nottingham) Ltd. with a view to obtaining dye levelness, penetration, shade and obviating skitteriness, observed Mr. C. F. Ward, M.Sc., F.R.I.C., F.T.I. (chief chemist, W. E. Saxby (Nottingham) Ltd. The first necessity, he said, was to prepare a series of "absolute" dyeings, consisting of patterns dyed at strength of 0·1%, 0·2% and so on usually up to 1·0%. Thus they obtained ten standard dyeings. A series of five 1% dyeings were made under standard conditions, say to 120°F. These were terminated respectively at 15, 30, 45, 60 and 90 mins., which was a reasonable set of time intervals. The resultant dyed materials were compared with the ten standard dyeings and a little experience soon enabled the investigator to plot a curve showing quite reasonably the rate of dyeing of the colour at 40°C. Similar curves could be prepared at 150, 180 and 212°F. thus giving a complete picture of the behaviour of a dye under the given conditions. Most carpet yarn, said Mr. Ward, and a good deal of hosiery yarn was dyed with acid levelling colours using the normal auxiliaries and controls.



Mr. C. F. Ward. M.Sc., F.R.I.C., F.T.I. (chief chemist, W. E. Saxby (Nottingham) Ltd.), shows a rate of dyeing chart used in the investigation of application of dyestuffs. Mr. Ward spoke on "Recent Developments in the Dyeing of Wool and Mixture Yarns"

The advisability of discussing the practical implication of the hydrogen-ion concentration (the pH) of a dye liquor was emphasised, and there was a tendency to confuse this function which was really a measure of the "pressure" or "power" of the acid, with the actual concentration of the acid, which was quite another thing. Work done had indicated the importance of knowledge of rate of dyeings and pH control in handling the fast "neutral" dyeing colours, including the pre-metallised dyes. With a straightforward dyeing, temperature, hydrogen-ion system, a broad and safe buffer was essential. A razor-edge control would only lead to disaster as would uncontrolled temperature variations.

Mr. Ward then went on to discuss the control of rate of dyeing by the use of auxiliary chemicals at lower hydrogen-ion concentrations. Criticisms had been made that the handle and the general quality of wool yarn dyed at pH 6·0 to 8·0 were not all it should be but very large quantities of wool were dyed by "neutral" methods with perfect satisfaction as regards knitting and wearing. There were, however, attractions in considering processes which could be carried out in a lower pH range round about 3·5 to 5·5, i.e., in the range of normal acetic acid dyeings. Straightforward application of "neutral" dyes at this pH would be disastrous but various devices had been devised to overcome the tendency for the colours to rush on the wool when applied under these conditions. There were two methods of approach:—

(1) The wool could be saturated with some large colourless molecules which might be applied like ordinary acid dyes. It could be argued that if sufficient loading of the wool had taken place and a fast dye was introduced into the system, a sort of "battle royal" would take place, and if the conditions were chosen correctly, an exchange of coloured dye for colourless auxiliary might ensue thus producing a level, well-penetrated dyeing.

(2) The other system was to change the dye into something quite different thereby giving it new properties which might possibly be utilised in producing a well-dyed shade, even in quite strongly acid solutions.

The simple theory behind this process, said Mr. Ward, was that the dye molecules could be made to combine with a chemical in "solution" in the dyebath before they could be taken up by the wool, and then set free in such a slow and regular manner that the wool would have no difficulty in taking them up in an even distribution thus ensuring level dyeing. The importance of complexing or levelling agents which were reputed to be of the non- or cationic-colloidal type must have certain properties to be successful: (*a*) they should be soluble in both cold and hot water, (*b*) be stable to relatively wide pH ranges, (*c*) form a reasonably stable compound with the dye molecule or molecules, (*d*) liberate the dye at a rate which could be controlled, and (*e*) not be absorbed by the wool either itself or in combination with the dye.

If any of these conditions were not fulfilled, instability or too great stability could result. The conclusion, said Mr. Ward, was that for the general use of pre-metallised and fast neutral dyeing acid colours, either separately or in mixtures' neutral condition, controlled by time and temperature, and based on a suitably chosen buffer system was still probably to be recommended.

Regarding the dyeing of mixtures of wool with other fibres, certain principles had to be observed: (*a*) one should always set up a dyeing system with its limit adjusted to the most sensitive fibre, (*b*) deal with the dyeing of the other fibres first, and (*c*) the physical conditions under which dyeing was conducted must be carefully controlled.

Whenever an investigation was being made into the dyeing of blends of two or more fibres, much more information could be obtained. Small flat frame machines were not expensive and by knitting on an alternating system of pure yarn producing about ¼-in. stripes, really informative dyeings could be produced enabling the subsequent dyeing of the blended yarn to be tackled with complete confidence.

Modern Spool Axminster Carpet Manufacture

THE prevention of pile yarn waste was discussed by Mr. G. H. Yates (sales manager, Platt Bros. (Sales) Ltd.). For a very long time it had been felt and indeed it had been proved, he said, that the winding of spools on a setting frame was fraught with some hazard. After many mechanical means have been thoroughly investigated and tried one was still faced with several variables which could not be controlled by known method. After a considerable amount of trial and experiment Platts decided that the application of a measuring device was necessary which would ensure that each spool contained an identical quantity of yarn to its neighbour. The Trumeter measuring device with electrically-operated clutch had gone a long way to improving the original performance of a mechanical measuring motion, and Platts had now decided to apply a measuring motion to the yarn itself. Together with an electrically-operated stop motion to each individual end this would seem to afford a definite means of ensuring that the exact amount of yarn was wound on each spool.

Turning to the loom itself Mr. Yates said they were faced as spool loom users knew, with the variation in braking tension applied to each individual spool as it was transferred from the chain into the cloth. Platts latest type of bobbin clasp with spring-loaded plungers went far towards improving the condition which existed with the old type bobbin holder, and they were now developing a pneumatic brake mechanism for both wide and narrow single span looms. Pneumatic brake mechanisms were not new, but their application introduced a new feature considered most important. By new patented mechanism the pressure on the spool was relieved to a minimum which could be adjusted to suit the user by means of a simple valve, so that at the point of draw-off the spool was free to revolve and the yarn was not under tension at the moment of inserting the tuft into the fell of the cloth. Full pressure was restored to the spool in its transference back to the chain, thus during its movement from the chain to the fell and back into the chain the spool was held firmly, but at the critical moment of drawing-off, pressure was reduced and the spool could be unwound gently by the draw-off cam, without damage whatsoever to the yarn, and therefore the risk of a low row was completely removed.

This question of overall efficiencies in our factories was one of great importance and Platts had recently developed a new back part to their narrow looms which provided for the accommodation of 36 ins. diameter chain beam and 24 ins. stuffer in an improved yarn beam loading arrangement. Wide loom users, particularly those who did not employ very long patterns, would be interested to know that Platts were now supplying these looms with a magazine creel, which was comparatively simple in operation.

Assuming one had a wide loom with a pattern of 250 bobbins. The loom was

working normally with this pattern in the chain. An extended gantry was fitted behind the loom which contained another complete pattern of 250 bobbins. This second pattern was free and could be loaded and unloaded at will, without interfering with the working of the loom, and it was only when the working pattern was exhausted that the loom was stopped, the end of the old pattern chain disconnected and attached to the beginning of the new pattern, which was in the magazine creel. Once the pattern had been run over and the new bobbins had taken their place in the gantry proper, the old exhausted patterns had then found their place in the back of the loom, in the magazine. As soon as the last spool of the new pattern was reached, the continuous chain was disconnected and the short chain pieced up so the loom was then free to run with its 250 bobbins, leaving the old chain at the back of the loom to be stripped of spools and replenished at the convenience of the mill operative staff ready for the next changeover. It was estimated that if a pattern took eight hours to change, the magazine creel reduced the time to 1½ hours, said Mr. Yates.

On the question of multi-loom operation by one weaver, although Mr. Yates did not claim that a complete pattern change was made without stopping the loom, the down time was reduced very considerably by the adoption of a modern gantry layout. Where narrow looms were arranged face to face the carpet of course was taken underneath and a drip tray placed under the loom to guard it against infection from, or soiling by oil, or any other foreign matter. The carpet was rolled up at the back of the loom by the conventional cloth taking-up frame. When wide looms were placed face to face for operation two looms to one weaver, it is not possible to take the carpet underneath the loom because of the centre supports and framings in these massive pieces of machinery, so the loom is placed on piers and the weaver stood on a raised platform, the carpet being rolled up in a suitable space underneath the platform. The cloth winding-on frame could remain stationary and the piece be pulled off by hand, or it could be made of a portable type to be withdrawn sideways, where the carpet was then unrolled or the frame itself moved bodily to the picking room. Where height was not sufficient to allow looms to be erected on piers, it had been found possible in some instances to provide suitable pits for the cloth winding-on frame to rest in and the pits were carried backwards between the centre baseplates of the loom to provide access for the tuners to the working mechanisms.

Mr. Yates emphasised the important advantages of pits or piers. Not only did they provided the facility for two looms to a weaver, but they provided an easy access and working position for tuners and mechanics, and such looms were better serviced in consequence. Reference was made to what was described as "almost an entirely new loom." The present split shot spool axminster loom which was of the single insertion type, and which was originally invented by T. Bond Worth and Sons Ltd., and engineered and produced by Platt Bros. (Sales) Ltd. was, of course, a single insertion loom. Platts had been interested in developing a single insertion split shot loom to produce high density cloth 12, 13, 14 rows per inch, with a view to utilising a very low pile and so producing an extremely high quality axminster cloth, which would be useful for the contract trade, which formerly was only able to be manufactured on a single needle loom at single needle slow speeds. This machine was now available in growing numbers on the market. Those who are not users of Wilton looms would appreciate that such a loom gave the possibility of tendering for contract work with a very high quality cloth indeed, and it did provide another possibility of introducing the colour range of the spool loom in high quality cloth.

l. to r., D. Jagger (chief dyer, Carpet Trades Ltd.), R. Sykes (chief dyer, W. and R. R. Adam Ltd.), J. Culpan (dyer, John Crossley and Sons Ltd.), and R. Walton (chief chemist, John Crossley and Sons Ltd.)

Trade Catalogues

ROLLER COVERINGS. Characteristics of natural rubber, nitrile, butyl and neoprene roller coverings are briefly outlined in an interesting 20-page booklet produced by Dunlop Rubber Co. Ltd., 10-12 King Street, St. James's, London, S.W.1. Hardness testing, roller construction and maintenance, are mentioned, together with roller usage in many industries. The textile section includes a description of a specially developed composite roller, designed to withstand the severe localised loading conditions resulting from the scouring of wool in rope form.

* * *

SWEDISH DESIGN. Entitled *Kontur*, the first of two noteworthy publications released by the Swedish Embassy, 29 Portland Place, London, W.1, contains three articles of considerable textile interest: they are—"Wondrous Works in Wool," "Training Textile Designers," and "Swedish Textiles Today." The second, a profusely illustrated work dealing with Swedish design, contains fifteen pages illustrating various aspects of design in textiles.

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NEGRETTI AND ZAMBRA CATALOGUES. The latest editions of the following catalogues are now available from the Publicity Dept., Negretti and Zambra Ltd., 122 Regent Street, London, W.1. Indicating, recording, vacuum, pressure and differential gauges (list G/45/1, 1959), hygrometers (list H/20/2, 1959), glass thermometers (list T/50/1, 1958), mersteel thermometers (list T/40/2, 1958), air-operated proportional automatic controllers (publication No. R30/IP, 1958) and Ivix quality pressure gauge (publication No. G/46).

Classical Scottish Cloths

The patterns on the facing page are a few from the ranges manufactured by A. and J. Macnab Ltd., Slateford, Edinburgh, specialists in the production of homespuns, tartans and travel rugs. Photographed approximately threequarter size, linear, brief details are as follows:—

(1) ERC. Lightweight Shetland sports coating in black and white. This 58 ins. cloth is 11 - 12 ozs.

(2) ECA. Pastel shades of green, grey, gold and natural yarns are exquisitely combined to produce this Shetland sports coating, 58 ins., and 13 - 14 ozs.

(3) AAP. Faint check effect in ladies' homespun coating. The cloth—58 ins. and 21 ozs.—is constructed from brown, two-toned grey and natural yarns.

(4) BA. Chocolate, cream and green yarns give this all twist, Scottish District check, "Mar" cloth in 58 ins., 18 - 19 ozs.

(5) BA. "Russell," another Scottish District check employing crimson, black, gold, light fawn and natural yarns. This 57 ins. cloth is 15 ozs.

(6) LA. Dark grey, natural, gold and brown yarns, overchecked with crimson, give this smart "Glen Moidart," all twist, Scottish District check; 58 ins., 18 - 19 ozs.

(7) AAP. Pastel shades of blue and green with natural yarns provide a lightly checked homespun coating for ladies; 58 ins. and 21 ozs.

Huddersfield Textile Society

Preparing and Spinning Wool Blends*

By N. ROPER B.SC. A.T.I.†

WHEN preparing blends of wool and staple fibre for weaving yarns and knitted outerwear it is usual to recomb the two materials together. For other hosiery garments, half-hose and hand-knitting yarns, the general method of blending is to resort to additional gilling operations prior to the set of drawing. One good practice is to make up a stock blend of 50% wool and 50% staple tops made by recombing. Should a wool content of more than 50% be required the additional wool may be added by gilling prior to drawing.

When 100% staple fibre or blends of staple fibre and wool are processed on the orthodox worsted systems, the behaviour of the material is governed by the constituents of the blend. Where a low percentage, say 10 - 15% of staple fibre is employed, the setting of ratch, draft, twist, etc., are similar to those used for all wool, and little difficulty is experienced. On the other hand, as the proportion of staple fibre increases, problems arise and thought must be given to ensure satisfactory manipulations of the material. These problems arise because the newer textile materials have distinctly different properties and we endeavour—mistakenly in my opinion—to fit the new fibres to the old machines. A considerable proportion of the machinery running today was not constructed to process materials such as the new polymers and we thus set ourselves a far from perfect limit to the outcome of our efforts. Admittedly. the final product is passable but surely a better method would be to develop the new fibres to exhibit the maximum number of desirable features and to follow this logically with the construction of new machinery systems and techniques to fit the new fibres. Although this would be a long and difficult task it is far better to strive for an ideal than remain content with something that "will pass." In the meantime the following points are submitted for consideration by those whose daily task is to produce worsted yarns from staple fibre and blends of staple fibre and wool tops.

The trouble arises on conventional machinery largely because of the following factors:—

(1) Staple fibres are more prone to excessive static electrification than wool and this is rather more difficult to cure.

(2) The force required to withdraw a fibre from an array of staple fibres is much greater than that required to remove a fibre from an all wool assembly.

(3) Staple fibres are all the same length.

So far as the first is concerned, excessive electrification is never completely overcome even when artificial humidification of the processing room is carried out. At best, we can only keep it within tolerable limits. Since the formation of static electricity cannot be wholly prevented, its influence can only be removed by taking suitable precautions to ensure that all the charge leaks to earth with the minimum delay. To facilitate this either the textile material or the surrounding atmosphere must be made as good a conductor as possible. Static electrification can be controlled by the following methods:—

(1) Maintenance of high atmospheric humidity.

(2) Employment of means to ionize the surrounding atmosphere by the use of static eliminators.

(3) Use of anti-static agents.

The last constitutes a cheap, efficient and in some cases, the most practical method of controlling static. The principal of anti-static lubricants is to provide a conducting coating on the fibre sufficient to provide a leakage for the charge. Most synthetic fibres are delivered to the spinner dressed with a sufficient quantity of anti-static finish to facilitate processing. It must be remembered that dyed slubbings will have this water soluble finish removed and it is necessary to re-apply some anti-static lubricant before further processing.

The excessive force or drag required to draft staple fibres can be countered in gilling and drawing by the following methods. To reduce the drafting tension at the gilling stage the weight of the feed slivers may be reduced or alternatively, the density of faller pinning can be decreased. The former method is probably the better of the two, but has the disadvantage of lowering production. When 100% staple fibre is being treated it is often advantageous to remove every alternate faller. The writer's preference is for thinner slivers, especially when processing blends of staple fibre and wool, since removing alternate fallers causes a drastic increase in front ratch setting each time a faller drops with the consequent lack of short fibre control. This procedure may be disastrous if wool is present. Increasing the draft slightly often gives improved results.

When processing rayon staple and wool blends the problem of "slicing" sometimes occurs, i.e., when the blended sliver is being fed to the back rollers of the next machine, the man-made fibres pull away from the wool forming ragged edges, crooked fibres and the like, which often develop into slubs or cause the feed end to break. Slicing also occurs to a less extent with 100% staple fibres. A superior product is generally obtained by feeding the rayon ends into the centre of the gill box, the outside slivers being wool. This technique is strongly recommended since much of the raggedness is eliminated through the wool binding the rayon staple into the centre of the sliver and constricting it to that position until a more intimate blend is achieved. In certain cases nothing is lost by omitting the can gill and feeding rayon staple tops directly to the spindle gill. Once twist is inserted the trouble ceases. When making a blend the staple and wool, tops should be gilled separately and then mixed on the spindle gill using a stepped guide feeding the gilled ribbons to the back rollers in sandwich formation.

Should the wool component of a blend require further lubrication, it is advisable to gill the wool separately, applying the necessary oil or emulsion before blending with the rayon staple component. The reason for this precaution being that the lubricant has a tendency to cause the rayon to coalesce and the false twist, inserted by the balling head in winding a ball, to set during possible storage. This results in difficulty at the subsequent gilling operation a great deal of fibre breakage and slub formation taking place. If the sliver is to be wound into a ball it is advisable to decrease the balling roller speed slightly and employ as little weight as possible to prevent flattening of the sliver and greater adhesion of fibres to one another especially for 100% staple.

Drafting Tension

As an outcome of the high drafting tension of nylon and "Terylene" slivers it is found that when the draft in the gill box is adjusted for these slivers, the conditions are such that these fibres are drawn into the faller bed even at the back ratch, whereas at similar tensions a wool sliver has a tendency to almost "ride" on the "pins" of an open type gill. An increase of the back draft with the object of drawing the wool into pins would result in impossible drafting conditions for the staple slivers. Consequently, the successful drafting of blends of these fibres can only be achieved by the superimposition of the nylon on the wool slivers, the former then holding the wool component well down into the body of the pins. Utilising this method of feeding ensures that too high a nylon drafting tension is safely avoided by reducing the back draft without fear of the wool slivers riding on top of the pins.

In open drawing it is advisable to use ratches about 2 ins. wider than normal to reduce the drafting tension. Higher drafts can also be imposed, especially when the staple content is 50% or more. The degree of twist required depends on the fibre mixture but it will be lower than that for all wool. It has been found, for example, that an acetate/wool blend requires more and a nylon/wool blend less twist than a blend of viscose/wool. The twist content is not very critical when dealing with all wool materials but when staple fibre is being dealt with, the twist factor becomes very important and must be carefully adjusted until the optimum conditions are reached.

Staple fibre slubbings can also give trouble due to lapping of fibres round the front carriers. The reason is that the untwisting torque of the drafting fibres removes the slubbing twist to a point just behind the front tumbler and the fibres can attach themselves to the front row of carriers and pull out of the fibre array

* *Extract from a paper, "Modern Worsted Spinning Practice", given recently to Huddersfield Textile Society.*

† *Senior lecturer, Leicester College of Technology and Commerce.*

without hindrance. To correct this trouble when processing, say 4 ins. staple nylon the ratch should be adjusted to 7ins. and the back carrier set a little under 4 ins., from the front rollers; the front tumblers should also be removed and the front carrier disengaged from the drive. The front carrier gives support to the slubbings and allows them to draft satisfactorily and lapping cannot occur because the front carrier is stationary and the top tumbler absent. The back tumbler does not lap because the slubbing twist at this point is sufficient to hold the fibres in the sliver. This procedure is not recommended when wool fibres are present because of the wide front nip setting.

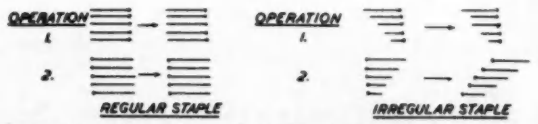
One spinning mill to my knowledge has successfully prevented carrier lapping by leaving both tumblers in position but disengaging the drive to both carriers. The carriers cannot lap and the tumblers are driven by the fibres passing underneath as it is always the case, of course; in this way the lapping problem is considerably reduced. A closer ratch setting may, however be advisable to ensure that the fibres pass continually through the drafting zone. A new coat of varnish might also prove an effective antidote.

When porcupine drafting is employed the staple fibre has a tendency to stick in the pins and uneven drafting sometimes occurs. To overcome this tendency the distance between the porcupine and the front roller should be increased. This decreases the angle subtended by the sliver and a more even drafting action and a more uniform product results. It is also helpful to press the fibres well down into the pins by using heavier tumblers. Another idea is to run the porcupine a little faster than for wool, say 98% of back roller speed. Employing rubber gill boxes instead of porcupine machines also results in an improvement in processing conditions. If the material is running well it is sheer folly to consider altering settings as this may only make things worse and it might be impossible to return to the best conditions again.

Despite every care to ensure smooth running, difficulties will arise when processing blends of staple and wool and the degree of mixing is a factor of vital importance. This is due to the fact that all the fibres are the same length and the surface properties of man-made fibres are different from those of wool. Because of the absence of scales, staple fibres in a blend tend to move at different speeds to that of wool and so effect the equilibrium in the distribution. This is not so important where the proportion of wool and staples are about the same, but it matters a lot where the amount of one constituent greatly exceeds the other. As in the case of all wool blends, the degree of streakiness may be influenced by depth of shade rather than the technique of mixing. This is attributed to the fact that the antithesis of white on a black ground is greater than that of black on white and light grey shades appear to be more streaky than darker ones.

The question of the desirability of using fibres of uniform staple length on the worsted system is controversial. Prior to the introduction of man-made fibres in staple form, it was believed that the ideal raw material for drawing would be a top with a square fibre diagram which, having constant fibre length, would eliminate the danger of floating fibres and resultant irregularity during the drafting. This goal could have been almost achieved by combing, but the very low tear ratio necessary to realise this objective would have made it economically prohibitive. With the introduction of man-made staple fibres—a raw material of uniform fibre length—it was generally felt that superior yarns would be obtained.

Fig. 1.



New problems have arisen, however, and the predominant feature in drafting regular staple is the difficulty experienced in breaking up clusters of fibres with co-terminate lengths. The diagram (Fig. 1) shows the action taking place when clusters of fibres are drafted. In the case of both regular and irregular staples all the fibre ends reach the drafting point at the same time and the fibre end spacing remains undisturbed, i.e., the fibres move forward together and the cluster remains.

At the next drafting operation the fibre direction is reversed and, in the case of an irregular staple, any group of fibres with adjacent leading ends at the first drafting stage will be scattered at the next operation in the sequence owing to the reversal of the drafting direction, resulting in the presentation of the ends of trailing fibres to the rollers. With regular staples the fibre ends remain co-terminate no matter how many draft reversals take place and the bunches of fibre remain. When the yarn stage is reached, the clusters not noticeable in drawing might show as thick places all along the thread. A careful scrutiny of some blends of wool and staple in roving and yarn form has revealed the existences of bunches of staple fibre which would produce deleterious effects in the ultimate fabric.

It is difficult to suggest how to overcome this problem of "bunching," since the thick top slivers with its myriad of fibres per cross-section must contain many clusters of fibre with co-terminate end spacing. I would suggest that the top be converted to roving with as few operations as possible to try to prevent the formation of new fibre groups. Perhaps the best solution would be for the producers of staple fibres to produce a top with an irregular staple and giving a fibre length distribution as well as fibre end distribution.

Package Size

Spinning and twisting packages are becoming increasingly larger with correspondingly greater winding-on tensions. Similarly, winding machines are running increasingly faster, again producing larger tensions on the thread, and the figures in Table 1 are extremely interesting. The conclusions are obvious, i.e. higher spinning and winding tensions lead to weaker and more irregular yarns. The softer the twist and the more pronounced these effects will be. Winding tension is particularly important at present, especially in view of the rapid expansion in the use of automatic looms which requires stronger yarns, and the growing practice of assembly winding or single yarns prior to twisting.

At this point I would like to make a special plea on behalf of my knitting colleagues in the Midlands on whose behalf the Leicester School of Textiles carry out many tests. We frequently do count checks on packages of yarn and invariably find that the count at correct condition is heavy. This means that a longer length of yarn is required to knit a dozen garments. The reason for this I place at the door of "spinning light."

Most spinners are well aware that the yarn leaving the spinning frame is well below the official moisture regain of 18¼%, and accordingly, spin their counts 5 or 6% light to allow for the condition to be added during winding or warping. If a fixed margin is allowed for "light spinning," irrespective of the counts, the type of spinning and the atmospheric conditions prevailing at the time of spinning, then the resulting counts at the full condition of 18¼% may be heavier than the estimated value since the regain from the spinning is often, in dry periods, as low as 9%. The best procedure is to base all spinning counts on the dry weight, making full allowance for the condition of 18¼%.

Consider also, the regain figure of 18¼%. Yarn is invoiced at a figure of 18¼% regain, a purely fictitious figure which knitters do not require, at which they never knit and which has to be forced unnaturally into the yarn by the spinner or dyer. As mentioned earlier, yarn leaves the spinning and/or twisting frame at a low regain and the difference is made up by artificial conditioning. The moisture may be added during winding and warping by means of a conditioning roller; yarn on spool or in hank is usually conditioned up to standards by spraying. The disadvantages and risks involved in spraying are obvious and the practice should be condemned. The condition roller on winding machines is also a menace, since the water content on leaving the roller may be well over 20% in order to compensate for the amount thrown off by the revolution of the package. The tension on the thread varies substantially during winding and since wool stretches easily when wet, differential stretching of the thread occurs.

Table 1

Yarn	Spinning Tension	Breaking load	Breaking load, %	Breaking inches	Elongation %	Uster Irreg., %
1/12 5 t.p.i.	10	5·5 ozs.	100	2·1	100	13·1
1/12 5 t.p.i.	40	4·2 ,,	76	1·9	90	13·1
1/12 5 t.p.i.	70	3·9 ,,	70	1·7	81	13·9
1/36 14 t.p.i.	10	3·6 ,,	100	3·1	100	20·9
	25	3·3 ,,	92	2·5	81	21·5
	40	3·0 ,,	83	2·0	64	22·4
	Winding Tension					
1/12 5 t.p.i.	40	10·1 ozs.	100	2·1	100	13·1
	40	10·2 ,,	101	1·4	66	13·8
	70	9·9 ,,	98	1·3	62	14·9
	100	9·1 ,,	90	1·0	48	15·0
1/36 14 t.p.i.	30	3·6 ,,	100	3·1	100	20·9
	30	3·1 ,,	86	2·1	67	21·7
	50	3·0 ,,	83	1·9	60	22·1
	70	3·0 ,,	83	1·7	55	23·4

Society of Dyers and Colourists

Possibilities in Emulsion Printing

IN recent years, particularly on the Continent and in the U.S.A. increasing attention had been paid to the possibilities of printing dyestuffs, other than pigment printing composition, from emulsion thickened print pastes, but before discussing the practical application of such systems it was necessary to appreciate the underlying principles involved, said Mr. T. L. Dawson (I.C.I. Ltd., Dyestuffs Division) in a recent address to Manchester Section of the Society of Dyers and Colourists. To distinguish between oil-in-water and water-in-oil emulsions, two simple tests could be applied, he continued. If mixed with water, an oil-in-water emulsion remained stable and visually homogeneous, while a water-in-oil emulsion broke and did not mix. An oil-in-water emulsion could also conduct electricity, while a water-in-oil emulsion could not, since oil was the continuous phase.

For printing applications the emulsion thickening used should be stable (*a*) to the dyestuff used and (*b*) to the non-dyestuff constituents of the print paste (e.g. salt, acid, alkali and metal salts). Thus anionic dyestuffs could not in general be used with cationic dispersing agents and conversely. In a similar manner additions of electrolytes could, for example, affect either the distribution of the emulsifier between the aqueous and solvent phases, or the charge on the particulars of the disperse phase so that the emulsion tended to "invert" (change its type) or to "break" (separate into two phases). Some emulsifying agents, although compatible with the dyestuff, might affect its fixation. Thus Lissolamine A (I.C.I.) for example, could not be used in conjunction with vat or Onium dyestuffs because of its restraining action.

The viscosity of the emulsion should be within a suitable range for application by printing (say, 500/5,000 centipoises depending on the method of application and the fabric being printed), and this was controlled by suitable adjustment of the phase volume relationship. Addition of water to an oil-in-water emulsion reduced the viscosity while oil phase additions caused the same change in water-in-oil emulsions. For this reason oil-in-water emulsions were more easily washed-off from printing rollers than water-in-oil emulsions, because the latter tended to thicken and finally broke on admixture with excess water while the former became thin and remained emulsified. When the emulsion broke the oil phase collected on the surface of the aqueous phase and this introduced a fire hazard.

Oil-in-water emulsions were usually less difficult to prepare than water-in-oil types and tended to be more stable towards electrolyte additions. Low speed stirrers were often sufficient to produce oil-in-water emulsions while high speed stirring and homogenisation were usually required for the production of the water-in-oil type. If, as in normal colour shop practice, a stock thickening was prepared, the oil-in-water emulsions were made more amenable to subsequent additions of aqueous dyestuff pastes or solutions, since these additions required no further emulsification, as would be the case with water-in-oil stock thickenings.

Water-in-oil emulsions were also reported to have superior lubricating properties to oil-in-water emulsions, which in turn were superior to conventional thickenings. This effect was presumably due to the lubricating action of the oil phase, this being greatest when the oil was in the external phase. The superior lubricating properties of emulsion thickenings resulted in a reduced tendency for roller and doctor blade damage which caused streaking or scumming in printing. For these reasons oil-in-water emulsions were technically preferable. On the other hand the water-in-oil emulsions were economically more attractive because of the lower consumption of hydrocarbon oil.

Examination of a wide range of emulsifying agents and film-forming materials for the application of various classes of dyestuff had enabled recommendations to be made (Table 1) for the application of a number of different classes of dyestuff.

Emulsion thickenings might be used for both screen and roller printing but to date no satisfactory emulsion had been obtained for conventional block printing. Where a polyurethane foam replaced a conventional block surface, however, transfer of an emulsion thickening might be obtained.

General Advantages

Printing was possible from a thickening of a very low solids content even under conditions where conventional thickenings of high solids content would normally be necessary. This property, characteristic of emulsions thickenings, was due to the contribution made to the print paste viscosity by the volatile hydrocarbon. From 35 - 65% of an emulsion print paste consisted of the hydrocarbon oil, while the gum solids content might be as low as 0·3%. Conventional gum thickened print pastes might on the other hand, contain as much as 30% solids. This was clearly shown in photomicrographs of cast films from the two types of thickening.

As a consequence of their low solids content and the volatile nature of the oil phase, emulsion thickenings dried rapidly when printed on the fabric and this was particularly important in screen printing. Fabrics printed with emulsion thickenings were also very much softer after drying than are those to which a conventional print paste had been applied. In this condition they were much less liable to creasing and/or to marking-off during ageing.

The residual solids remaining on the printed fabric after the dyestuff had been fixed were more readily removed by washing since the film-forming material was present in very much lower concentrations than when normal thickenings were used. This allowed faster and less severe washing-off treatments to be given to the fabric while ensuring an excellent handle in the finished print with minimum distortion of the fabric surface. This was particularly valuable in the case of raised or pile fabrics, e.g. lightweight dress corduroys. Where wet processing involved a piling operation, the danger of marking from the printed design was much reduced when emulsion thickenings were used.

Table 1. Survey of Oil-in-Water Emulsion Thickenings Suitable for Various Classes of Dyestuffs

Class of Dyestuff	Film-forming Agent	Emulsifying Agent	Additional Properties of the Emulsion
Procion	Manutex RS (A.I.L.) or Celacol MM10 (British Celanese)	Perminal PW	Also of interest for applying Duranol and Dispersol dyestuffs
Caledon and Durindone vat dyestuffs	Alginate C (A.I.L.) or Celacol M2500 (British Celanese) or Solvitose C5 (Scholtens)	Perminal PW Perminal EML	May be used for white discharges (omitting the alkali carbonate) an addition of Bedafin 285X may be required
Alcian 'X'	Indalca U (Cesalpinia) or Meyprogum CRX (Meypro)	Dispersol VL/ Lissapol N	Also of interest for acid dyestuffs and oxidation blacks
Brentogen dyestuffs	Alginate C or Celacol M2500 or Meyprogum CRX	Dispersol VL/ Lissapol N	Also suitable for applying neutral steaming azoic dyes

After washing and drying the absence of a residual thickening film often resulted in brighter prints. In some cases quite a striking improvement resulted and attention was drawn to such examples when individual classes of dyestuffs were described. The soft handle of washed prints ensured a very even pick-up of resin and avoided the necessity to give a malting or other enzymic treatment to printed goods prior to resin finishing.

The emulsion thickening generally penetrated less deeply into the fabric than many conventional thickenings, thus giving a higher visual colour yield. Although quantitative measurements revealed that in some cases the overall dyestuff transfer was not significantly different from normal thickenings, the emulsions did enable economies in dyestuff to be made since the apparent yield was high—as with starch based thickenings—without the associated disadvantages of the latter with regard to handle and washing-off.

The printed "mark" produced by an emulsion thickening, particularly in roller printing was determined by the viscosity of the made up printing paste. In machine printing, it had been found that more level prints were obtained if rollers having fairly shallow engravings (0·1 mm. — 0·15) (4 - 6 thousandths of an inch) were used and the prints were given a light crush. This was particularly the case where a blotch pattern was being printed.

Procion dyestuffs printed from an emulsion thickening showed a good, sharp mark, and were more readily washed-off (and, therefore, required less soaping) than those printed from the conventional thickening. The prints from the emulsion system also showed less tendency to mark-off during processing. An increase in visual colour yield of up to 20% was obtained with many Procion dyestuffs, and this was particularly noticeable on viscose rayon fabrics. Procion Brilliant Blue H7G also gave brighter prints when applied from an emulsion system as well as increased visual colour yield.

When printing Procion dyestuffs on natural silk and chlorinated wool, sodium alginate thickenings had been found to give poor definition in certain designs. For this reason the use of Celacol MM10 (British Celanese Ltd.) had been recommended. An alternative was to print the Procion dyestuff from an emulsion thickening for, although the solids content of the thickening was low, excellent clarity of mark was maintained throughout processing.

In printing viscose tufted carpets the use of an emulsion thickening offered advantages, particularly with regard to the ease of washing-off the carpet after fixing the dyestuff. Vat dyestuffs printed from emulsion thickenings gave a sharp printed mark even at high printing speeds and gave high visual colour yields, particularly on cotton fabrics, normally associated with starch containing thickenings. Unlike the latter, however, the prints were readily washed-off to give goods having a soft handle. The tendency to mark-off on wet piling was much reduced. In certain cases, e.g. when printing QF Caledon Printing Jade Green XBN and QF Durindone Printing Pink FF, the colours appeared notably brighter than when printed from conventional thickenings.

In screen printing, underwarm, humid conditions, emulsion prints with vat dyestuff showed much less tendency for the sodium sulphoxylate formaldehyde to decompose than when a starch-tragacanth thickening was used. There was also an advantage if steaming of roller prints had to be delayed for some reason or other. Excellent prints might be obtained using an emulsion thickened print paste with Alcian "X" dyestuffs by any of the recipes recommended for these products. In blotch prints using conventional thickenings the most level results were obtained using a thickening prepared from Indalca U (Cesalpinia) or Meyprogum CRX (Meypro Ltd.), but with the emulsion above prints of Alcian Blue 8GX or 7GX as well as being level, had superior brightness.

The emulsion thickening was particularly suitable for non-steam styles where the acetic acid/sodium acetate recipe was used because the wet after-treatment could be omitted to provide a useful method of printing Alcian Blue 8GX alongside pigment printing compositions. The handle and fastness to rubbing of the prints obtained using an emulsion thickening was excellent, being much superior to those obtained using a starch containing thickening.

With Brentogen Dyestuffs

Apart from the advantages of ease of washing-off associated with the emulsion thickening, the low solids content of the thickening allowed better access, and therefore, more rapid development of the prints by acid steam. An emulsion thickening offered a means of printing Brentogens alongside pigment printing compositions with a subsequent minimum amount of washing-off. For certain shades (reds, navy blues, bordeaux) Brentogens might be printed alongside pigments to give prints having superior dry-cleaning fastness.

For printing synthetic fibres such as nylon, secondary acetate, triacetate and "Terylene" polyester fibres, emulsion thickenings had been found to give excellent clarity of mark, normally associated with high solids thickenings, while at the same time they did not exhibit the poor fibre adhesion properties of the latter. Experience in the laboratory had shown that, during handling after printing and dyeing, there was less tendency of the thickening from the emulsion to flake-off, resulting in specks of colour developing on the white portions of the fabric on steaming. For example, disperse dyestuffs might be applied to nylon, acetate or triacetate fabric using the emulsion formulation recommended for Procion dyestuffs, while acid dyestuffs might be applied using the emulsion recommended for Brentogens. The latter emulsion was also satisfactory for printing stabilised oxidation blacks such as Soloxan Black S.

In the application of vat dyestuffs to "Terylene"/cotton union fabric, emulsion thickenings had been found to give much better colour yields than if the preferred conventional thickening, Nafka Crystal Gum, was used. Semi-bulk scale trials had shown that it was possible to use an emulsion thickened print paste of the type recommended for vat dyestuffs (omitting the alkali carbonate) in place of a conventional high solids thickening to obtain white discharges.

The foregoing recommendations were only to be regarded as general indications of the fields in which emulsion thickenings might be used to advantage.

Making Re-Equipment Pay—Some Deciding Factors

THE investment of capital in productive machinery involves the trading of solid present values (usually cash) for more or less hypothetical future benefits and is, therefore, always something of a gamble. Investment in replacing old machinery by new in the same product manufacture (e.g. weaving) generally involves less uncertainty than say, investment in the manufacture of an entirely new product (e.g. bonded fibres), but even so much uncertainty remains, and the decision to invest often depends largely on the judgement and experience of those who take it. However, much can be done in the way of systematic calculations relating to as many of the effects of re-equipment as are measurable, thereby limiting and defining the area in which judgement must operate unaided, and how these calculations should be made formed the subject of a lecture given recently by Mr. K. P. Norris to the British Association of Managers of Textile Works.

Among the measurable effects amenable to calculation listed by Mr. Norris were:—

(1) Cost of production.
(2) Attractiveness of product.
(3) Reduction of work-load on employees.
(4) Shift working.
(5) Increased capacity for increased sales.
(6) Taxation.
(7) Loss of interest on capital.

These could be further broken down according to individual conditions thus the cardinal principle in assessing the effects on costs was that the comparison be made between alternative future courses of action —keeping the old machine (assuming it was serviceable), or replacing it by the new machine—and that, therefore, the only items of cost to be considered were those incurred by taking the one course, and avoided by taking the other.

The effect of the new machine should be stated first in terms of physical quantities—labour required, power consumed, space occupied, and so on—and then converted into terms of money. If the new machine showed a saving in operating costs, the next question was whether this was sufficient to justify the capital cost of the change. Any capital expenditure needed to fit the old machine for further use was relevant, and so was the sale value, if any, of the old machine, though the latter was often negligible. The correct comparison, therefore, was between the operating cost plus the capital cost of the new machine, and the operating cost plus re-conditioning cost (if any), plus sale value of the old machine.

Since capital cost was a single payment, while operating costs were a flow over time, they could only be added, and the totals compared, if some assumption was made about the number of years over which the capital cost could be spread. Probably the most generally useful way of expressing the results of re-equipment calculations was to avoid assuming a period of depreciation, and to relate the annual savings to the net capital cost of the new machine (after deducting any capital costs of retaining the old machine). If the capital cost was divided by the saving, the result was the period of recovery, or number of years in which the outlay would be repaid. The person taking the decision had then to decide whether the useful life of the machine was likely to be longer than this; if so, then the investment was justified.

Society of Dyers and Colourists

Modern Package Dyeing

IN a complete dyeing installation complete versatility was essential as it must deal with every type of dyestuff on every fibre by every known process said Mr. C. A. Gibb (John Godrich) in a recent talk to the Manchester Junior Section of the Society of Dyers and Colourists. An installation usually consisted of a combined apparatus which is used for milling and scouring and all the ancillary processes, a dyeing machine and a drying machine. Bleaching apparati for high pressure were also available and ancillary equipment was of course necessary. The modern package dyeing machine built of V4A stainless steel was designed to work all constant static pressures up to 5 atü, and independent of temperature which could be controlled between 0°C. and 130°C. by a heat exchanger. Liquor containing the dyestuff could be pressed into the system slowly so that the addition of dyestuff was literally dripped into the circulation thus ensuring that it went on to the packages evenly.

Static pressure which could be varied even during dyeing promoted levelness and penetration. Shorter dyeing times could be obtained and more difficult combinations used. Complete automatic control was possible and the machine was thus completely versatile and could be used for dyeing any type of dyestuff on any type of fibre.

The most modern drying system used high static pressure with a re-circulatory system, continued Mr. Gibb. After leaving the packages the air was saturated with moisture and passed through a condensor which removed most of the water and it was circulated once again, the drying being completed with the air never becoming quite dry. The whole system was under static pressure, because this enabled more drying energy to be supplied to the packages. Very short drying times could be obtained but the average was about 45 mins.

The package itself was responsible for more difficulties than anything else in package dyeing. Each package should be exactly the same density from inside to outside and each the same density as the others. The general overall density was most important and the package should be reasonably firm whilst still allowing the dye liquor to circulate properly. To prepare these even well penetrated packages it was essential to have proper specifically designed winding equipment. Hank dyeing—which previously caused difficulty—could now be carried out in a new type of cage. This was divided into sections to prevent the possibility of compression and this technique ensured even dyeing and gave the wool an excellent lofty feel.

With synthetic yarns the main problem was that of penetrating the package which, in many cases, was much harder due to fibre swelling. The cotton industry, too, had demanded a higher package, and the centrifugal pump could not cope satisfactorily with these harder packages. The turbo pump overcame the difficulties, however, as it continued to provide high flow even at very high differential pressures, and also presented no difficulties, if the flow was reversed.

The best dyeing method for tow dyeing was on the beam, said Mr. Gibb. Special techniques were required and fibres varied somewhat in their processing. The tow was passed through hot water and run on to the beam. The hot wetting produced a solid, hard but even mass of fibre. The density was generally about 600 - 700 gr/l and the turbo pump immediately came into consideration as very high differential pressures were inevitable. Scouring had now been found to be unnecessary.

Dyeing Piece Goods

Piece goods of synthetic fibres were usually dyed either on beams or a star frame. In the former the cloth was dyed in a horizontal machine and good results were obtained but the winding needed to be done very carefully; the differential pressure was high.

The star frame required a special dyeing machine. The cloth could be dyed with or without tension, and the fullness and handle of the result controlled. The advantages were (*a*) no creasing, (*b*) no lesting or ending, and (*c*) a very much improved handle and cloth quality. Unfortunately the batch weights could not be high.

American Techniques

The possibility of dyeing large weights to the same shade enabled the Americans to organise the dyehouse to the last screw. Typical dyehouses had an upper floor with the laboratory and colour shop. The ground floor was the dyehouse proper and the cellar contained the utility services. Automatic controls were used wherever possible.

Each shift was checked for production and cost, and a healthy spirit of competition was fostered. To get the best out of the system, a large through-put was necessary and harder packages demanded, i.e., increased batch weight. Dyeing processes were varied to suit the system and the demand, of course, was for shorter dyeing times.

Vat Dyeing.—The pigment padding process was used almost exclusively, employing what appeared to be a shortened process. The absence of caustic soda in the pigmentation bath avoided fibre swelling and so helped penetration.

Azoics.—Penetration of dense packages was difficult, but impregnation was usually started at about 80°C., reducing to 30°C., and took about 45 mins. Development was done as cold as possible for about 20 mins. After-treatment is most important; after thorough rinsing the material was soaped twice at 60°C. and near the boil.

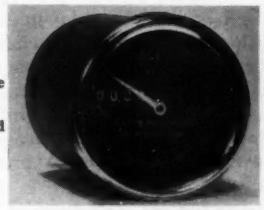
Bleaching.—High temperature and pressure were used for bleaching, with hydrogen peroxide and polyphosphates appearing to be favoured stabilising agents.

Drying.—The high pressure dryer was essential but, as the packages were denser, the drying took about 60 mins., using a static pressure of 8 atü. Samples taken from the outside and inside the middle of the packages were knitted up, when the slightest unlevelness was revealed. This was probably the most stringent test of all. Capital cost was very high but if the dyehouse worked according to plan it paid well. Trade over here, however, would not allow the full system to be used.

Registering Operating Hours

THE elapsed time indicator, an instrument that registers the operating hours of a machine, is invaluable when assessing maintenance requirements and development of a new sealed and insulated unit by Cass and Phillip Ltd., Mark Road, Adeyfield, Hemel Hempstead, should greatly extend the range of applications for which elapsed time indicators are suitable. Basically, the new version is designed with a double-skin instrument case, the mechanism being mounted internally on beryllium copper-leaf springs. The balance staff, balance wheel and armature assembly are jewel mounted. The four leaf springs, spaced 90° apart, carry the complete mechanism, which is then inserted in a polythene case, the springs being located in grooves moulded in the case. This assembly is then installed in a steel outer case, and electrical contact is made through insulated terminals in the rear.

The dial glass is located in a recess of the polythene case, and a specially contoured rubber sealing ring, maintained in position by the bezel, completes the sealing. Apart from being sealed against ingress of water and dust, the instrument movement is electrically insulated from the case and, therefore, the case does not provide a connection to earth. Elapsed time can easily be read in hours and minutes to the nearest 15 secs., and timing accuracy is stated to be better than 15 secs. in 24 hours.



Elapsed time indicator, fully sealed and insulated

Courtaulds Ltd. and the trade delegation of the U.S.S.R. in the U.K. announce that Prinex Ltd. (a subsidiary of Courtaulds Ltd.) and the Soviet importing trade organisation V/O Techmashimport, Moscow, have concluded certain major contracts. These cover the supply of complete plants and technical processes for the manufacture of viscose rayon tyre cord, acrylic staple fibre and cellulose acetate yarn. The total sum involved is approximately £15,000,000.

Notes on Cellulose in Relation to Bleaching

Discussing this subject, the author deals with the composition and oxidation of cellulose, the oxidation of cellulose in drying, action of hypochlorites, reaction of cellulose with chlorites and hypochlorites, effect of hydrogen peroxide on cellulose, and degradation of cellulose

By "TECHNICAL CORRESPONDENT"

THE chemical constitution of cellulose is a most important field of fibre chemistry, in view of the fact that a much larger proportion of the world's textiles is made from cotton than from any other fibre. Also, as bleaching is a primary requisite to the dyeing and finishing of this very large section of the output of the textile industry, it is important to have some grasp of the nature of the reactions which govern the processing of cellulosic fibres.

It is also clear from experimental and practical evidence that cellulose is easily damaged in processing, and regenerated cellulose even more so. The recognition of this fact emphasises the importance of close control at every stage of processing, in particular where the effects of alkalis, acids, and oxidising agents are concerned as in bleaching.

Nature of Cellulose

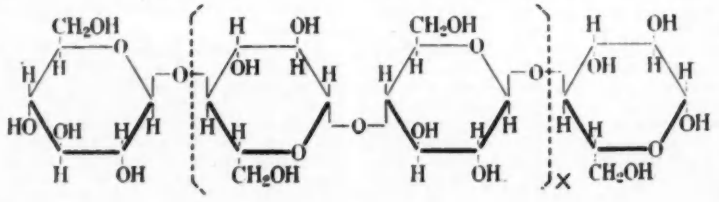
In his historical review of the nature of cellulose Heuser[1] begins with the work of Tollens, who in 1895 established the hypothetical chain formula for the chemical constitution of cellulose. His conception of single unit linkage, i.e., by the so-called double oxygen linking, also explained many of the physical properties of cellulose.

In another comment it is stated that: "Trained in the classical school of tackling problems of chemical constitution it was only natural and logical for Tollens that he thought of the glucose anhydrides as being linked together in accordance with the principle of polymerization in its original meaning, that is, by condensation of glucose units under loss of water. It was also logical and natural that he arranged the units in a chain. The amorphous nature of the cellulose, its insolubility, and other properties placed it in the class of substances of high molecular weight."

Heuser also draws attention to the work of Staudinger who from 1925 onwards developed his theory relating the molecular weight (chain-length condition) of cellulose in various forms to viscosity of solution. The main thesis is that the viscosity of cellulose in solution increases with increasing chain-length and conversely, and that in solution single chain molecules are dealt with. The logical outcome of this is that if decreasing viscosity indicates decreased chain-length, and supposing dissolution does not further reduce this length, it follows that the result of degradation is a shortening of the chain rather than the breaking of the lateral bonds between the chains, the micellae remaining intact till dissolution occurs.

Structure of Cellulose

Marsh[3] refers to the work of Tollens and Freundenberg who suggested that cellulose was a long-chain structure, but early X-ray evidence confirmed the already formed opinion in favour of a small structural unit. As it was recognised that cellulose was a highly polymerized substance its characteristic properties were thought to be due to the production of large aggregates by affinity, the structural unit conforming to the graphic formula:—



The work of Sponsler and Dore is then referred to by Marsh in the following terms: "Sponsler and Dore recognised that the constituent units are arranged in continuous chains which lie parallel to the fibre axis and through the unit cell of the X-ray determinations. The glucose units are bound longitudinally by primary valencies and laterally by secondary valencies. The primary valencies account for the chemical and mechanical stability of the fibre; the secondary valencies are easier to rupture, which explains the relatively low transverse strength. Further, this idea covers the swelling of cellulose by liquids, which do not attack it chemically, but may enter between the chains and widen the space between them. Esterification and etherification are possible without loss of fibre form on the assumption that the new groups will accommodate themselves in the spaces between the chains."

An intensive period of study with reference to the structure of cellulose began, according to Davidson[3] about 1920, and it is pointed out that the conception of the cellulose molecule accepted between 1920 and 1926 was that of small structural glucose or cellulose units bound together by a form of residual valency.

This author points out that the molecular chain theory can be traced to the work of Sponsler and Dore in 1926, who revealed the possibility of

explaining the X-ray diagram of ramie fibres from the theory that the fibres are made up of long parallel chains of glucose residues linked by primary valencies. Further work by Meyer and Mark in 1928 showed that an arrangement of the molecular chains relative to each other satisfied X-ray data while still retaining the cellobiose linkage.

In this latter theory—"the micelle was pictured as a bundle of parallel chain-molecules in almost perfect crystalline array, separated from its neighbours by fairly definite boundaries. The modes of reaction of cellulose were conditioned by its micellar structure and the reactions were divisible into two classes, micellar surface and permutoid, corresponding to the two main types of swelling (penetration of water between the micelles or in the micelles themselves)."

Length of Cellulose Chain Molecule

On the basis of the foregoing facts it is obvious that the length of the cellulose molecule chain is a most important function. That this is so is illustrated by the fact that it has been demonstrated that as the chain-length is shortened into small units by acid attack, for example, the fibre becomes progressively weaker. Shortened units of the molecule chain also exhibit reducing properties as may be seen by reference to the structural formula and this property is made use of as a measure of the degradation of cellulose, by the method known as the copper number. This is based on the amount of copper reduced from the cupric to the cuprous state in a standard solution of alkaline copper sulphate by an established method.

It is pointed out[4] that the copper number rises with the increasing acid attack until at 5 the fibre is completely degraded. On the other hand, various forms of oxidation give differing results, for example, oxidation with bichromate will produce a fibre with only 20% loss of breaking load at a copper number of 5 which in the case of acid attack would signify a breaking load of nil. This is reflected in the fact that certain methods of oxidation produce fibres which are apparently strong until treated with dilute alkalis, which explains the large strength loss sometimes experienced in laundering on apparently sound fabrics. It is also thought that oxidation in such cases may produce alkali-sensitive linkages in the ring structure of the molecule without actually breaking the chain molecule.

It is further noted that the shorter molecular chain length conception of degraded cellulose is a measure of the lower strength and higher swelling power of regenerated cellulose in the form of viscose rayon. It is well known, for example, that solutions of alkali which will only swell pure cellulose will dissolve regenerated cellulose and this fact is made use of in the standard test known as the ***solubility number*** which measures the amount of damage to cellulose in a standard solution of alkali. This in fact removes shortened chain molecules whose length is below a stated minimum and so gives the measure of the chain-length distribution in the molecule. The low wet strength of viscose rayon is also explained by the short-chain molecule theory of degraded cellulose. This permits the high degree of rayon swelling observed in aqueous liquor, as well as the very low wet strength of the fibre which is only 50% that of the dry strength.

Composition of Cellulose

According to Marsh[2] cellulose on analysis consists of the following elements: Carbon 44·4%, hydrogen 6·2%, oxygen 49·4%, and this corresponds to an empirical formula $C_6H_{10}O_5$. It has a long-chain linear molecular structure shown in its colloid properties and in its chemical inertness generally. For these reasons the general empirical chemical formula is accepted as: $(C_6H_{10}O_5)n$. The presence of three hydroxyl (OH) groups per glucose residue is indicated by the fact that tri-radical compounds, such as cellulose nitrate and cellulose acetate, are formed.

Impurities in Cotton

It is commonly known that the impurities in cotton fibre vary within broad limits but, in general, correspond to a common chemical classification. The following figures are given by Hvattum and Turner[5] who quote Marsh and others as their authorities, to show that the average content in cotton of pure fibrous cellulose is 80 to 85%, water 6—8% and removable impurities 10%. Table I indicates the type and percentage of impurities.

Table 1

(Percentage by weight of grey cotton)	
Nitrogenous Matter	**1·0—2·8**
Mineral Matter	**1·0—1·8**
Waxes	**0·5—1·0**
Hemicelluloses and Pectins	**0·4—1·0**
Residue of Pigments, Resins, etc.	**2·0—5·0**

Hemicelluloses: According to Hvattum and Turner[5] these may not all be present in a non-fibrous condition in the cotton fibre and a clear definition of their structure is not available, but they are thought to be made up of units of anhydro monosaccharoses. They have a non-linear molecular structure and a corresponding low degree of polymerization and are more readily dispersed in cold and hot alkalis than pure cellulose. In kier boiling, for example, they are nearly all removed in the first hour.

In bleached cloth they have three main drawbacks (*a*) unstable chemically, causing yellowing in storage particularly at high temperatures and in the presence of traces of alkali, (*b*) their reducing properties affect some dyes and (*c*) they act as resists to certain dyestuffs.

Oxidation of Cellulose

Oxidising reactions form the basis of most bleaching processes and are directed mainly at the impurities to be found in fibrous materials. When conditions arise, however, under which the release of oxygen in the process becomes very rapid there is considerable risk of attack on the cellulose fibre itself as in the case of cotton bleaching. Tendering of cotton in bleaching and on long exposure to light is due to several well-known conditions, for example, metallic and dyestuff catalysis. In the latter case certain Vat dyes promote tendering on prolonged light exposure and for furnishing fabrics these dyes must be avoided.

From the point of view of bleaching the three main sources of damage to cellulose by oxidation are :—

(1) Kier boiling.
(2) Hypochlorite bleaching.
(3) Hydrogen peroxide bleaching.

If in kier boiling attention is not given to driving out the excess air then alkaline oxidation will occur, due mainly to the presence of oxygen at a high temperature and pressure. In the second place, that of hypochlorite bleaching, the greater the degree of alkalinity the safer the material, and tendering by oxidation is more likely to take place at the low or acid pH range of the reaction. Thirdly, hydrogen peroxide is used for bleaching, generally at pH 10—10·5, and if the temperature rises, or pH increases, then excessive alkaline oxidation will occur, due to rapid release of oxygen and formation of oxycellulose. Marsh[2] in Table 2 gives a summary of the properties of such degraded forms of cellulose.

Table 2
Chemical Damage to Cellulose

Treatment	Fluidity Before Alkali Boil	Fluidity After Alkali Boil	Copper Number	Carboxyl Content
Acid	Varies with attack	Not greatly altered	Varies with attack	Low—scarcely affected
Alkaline oxidation	Varies with attack	Small alteration	Low—relative to attack	High—relative to attack
Acid Oxidation	Low—relative to attack	Great alteration	High—relative to attack	Low—relative to attack

A summary of comments made by Marsh would indicate that while fluidity measurements are of great value in assessing damage to the original cellulose, the results will require careful interpretation. Attack by acid or alkaline hypochlorite will give material whose strength and fluidity are not greatly altered by alkali boiling.

Alternatively, the use of other oxidising agents will bring about increase in tendering and fluidity by an alkali boil, for example, marked rises in fluidity on alkali boiling are characteristic of neutral hypochlorite oxycellulose and excessive tendering by di-chromate oxycellulose. With reference to the latter, it is noted that, not only actual but potential tendering is indicated by the fluidity measurement, and it is stated that this constitutes a strong argument for quality control by fluidity, otherwise a fabric which would give good results on a tensile strength test could become 50% weaker on laundering.

Oxidation of Cellulose in Drying

In a discussion on the investigation of the "brown line" colouring matter formed during partial drying of cotton goods Dorset[6] refers to the work of Madaras and Turner (Jnl. Soc. Dyers & Co. 1953, 69,371) and points out that the general conclusion was that brown colour was formed by oxidation. If this were so, then the absence of oxygen should reduce this activity. Consequently Madaras and Turner carried out an experiment in an atmosphere of oxygen-free nitrogen and also *in vacuo* to ensure elimination of all traces of oxygen. Results showed that the brown line was not formed but a modified cellulose was produced having acid properties, increase of Methlene Blue affinity and higher fluidity[7] For this reason the production of (COOH) groups is difficult to explain, because they are normally the product of oxidation of the cellulose molecule with formation of (CHO) groups which in turn are oxidised to carboxyl (COOH) groups by influence of the surrounding air or any other oxidising substance present. It would appear then that the breakdown by oxidation of cellulose in the condition of the experiments quoted took place in the absence of any external oxidising agent.

It is then suggested that as the oxygen for the reaction just described cannot come from external sources, it must be a product of the cellulose. The theory is propounded that by hydrolysis, aldehyde groups are formed in the cellulose molecules and that these take part in a re-orientation in the course of which two of the aldehyde groups react with production of an alcohol and a carboxylic acid by a reaction discovered 100 years ago by Cannizzaro. The conclusion is reached that there is still much to learn about the reactivity of cellulose under varying conditions.

Action of Hypochlorites on Cellulose

It is known (Kauffmann[7]—Chem. Zeitung, 1930, p. 555) that hypochlorites act on cotton in a manner that is governed by the rate of reaction. For example, in an alkaline sodium hypochlorite liquor, if acid is added, the liquor acts with increasing power till a maximum is reached when activity falls off on the acid side and at this stage there is no damage to the material. In theory it is stated that fibre damage is greatest where the proportion of caustic soda in the bleach liquor is 1·5 molecules to one molecule of chlorine. Furthermore, if the bleach liquor is either definitely alkaline or acid, this danger zone can be avoided.

An interesting sidelight is that acid hypochlorite liquors are good stripping agents for dyes and are better in this respect than alkaline hypochlorite liquors, which are generally used.

Cellulose from Straw by the Use of Chlorine

The following interesting information is given by Inman[8]: "An important possibility has been opened up for the papermaker by the introduction of liquid chlorine. The chief constituent of esparto grass is pectocellulose, associated with a little lignocellulose and a smaller quantity of cutocellulose. "Lignocellulose is readily attacked by gaseous chlorine and by this means can be separated into the constituent groups:—

(1) The lignone (a ketone) which is chlorinated and can then be dissolved out.

(2) The cellulose. This reaction has been applied to the production of pure cellulose from straw. The process is briefly as follows: The pectic matter is removed by a preliminary boiling with caustic soda, and the partially disintegrated lignocellulose is then exposed to the action of chlorine. The quantity of caustic soda used is much less than would be required to produce a perfect pulp from straw by the ordinary process, thus avoiding the danger of destroying the cellulose itself, with the consequent low yield. The pulp, after washing and partially freeing from moisture, is exposed to the action of chlorine gas for several hours until the lignocelluloses have been chlorinated. It is then bleached in the ordinary manner with small quantities of hypochlorites. The bleaching operation is rapid and complete and, as severe alkali treatment has been done away with, the yield of cellulose is good. This process was patented in 1880 but was naturally little used. The difficulty and expense of producing chlorine at the paper mill rendered the scheme impracticable."

In the light of more recent knowledge on the activating influence of the protein-chloramines it is probable that the speed and efficiency of the foregoing process owed its success to the reaction between chloramines and chlorine.

Reaction of Cellulose with Chlorites and Hypochlorites

The basic fact which makes the chlorite process of bleaching so attractive for cellulosic fibres is that it attacks only the impurities in the cotton fibre and leaves the cellulose unharmed, thereby eliminating the risk of tendering. Normal sodium chlorite bleaching is carried out under weakly acid conditions at moderately high temperatures in corrosion-resistant equipment, either by impregnation or immersion processes. Under properly controlled conditions the bleaching action is rapid and the cellulose completely unharmed, with the additional advantage that the minimum of washing is required after bleaching as compared with hypo-

chlorite bleaching with intermittent souring and anti-chlor treatments.

In view of some of the facts discussed in the present article regarding the effect of hypochlorite on cellulose, the following notes on the use of chlorine along with sodium chlorite will be of interest. In B.P. 519,522 it is disclosed that chlorine (from sodium hypochlorite) when introduced into an aqueous solution of sodium chlorite and used as a bleaching liquor for cellulosic fabrics will not act in its characteristic manner of bleaching the cellulose fibre with degradation of the latter but will, instead, react with the sodium chlorite to release chlorine dioxide which in turn brings about the bleaching of the cellulose without degradation. The following reaction is probably typical:—

$$Cl_2 + 2NaClO_2 \longrightarrow 2ClO_2 + 2NaCl$$

The importance of this is that by the introduction of chlorine into the sodium chlorite bleach liquor in contact with cellulosic fibres, the bleaching action produced is characteristic of chlorites rather than hypochlorites, that is, without the degradation of the cellulose fibre.

Effect of Hydrogen Peroxide on Cellulose

Cellulose is not readily attacked by hydrogen peroxide under properly controlled conditions. On the other hand, high alkalinity and temperature will induce attack on the fibre after other impurities have been destroyed, and this attack may be accelerated considerably by the presence of catalytic substances, such as traces of iron or copper.

In bleaching grey cotton it is now known that the impurities in the cotton fibre have a definite stabilising action on the peroxide and the bleaching action can be kept under very accurate control by making use of this fact alongside the usual sodium silicate and alkali controls. Modern one-stage bleaching processes are based on the foregoing facts, namely, that cellulose itself is chemically very stable in addition to which the impurities and sizing matter usually found in grey cotton have a very definite buffering action which can be utilised in conjunction with the usual stabilising controls.

Degradation of Cellulose

Steadman,[9] in a discussion on *tendering of cotton fabrics*, states that generally it is known that the preparation and dyeing treatments given to cotton fabrics bring about a reduction in strength by degradation of the natural cellulose fibre. This is accepted as a loss in strength during processing and is thought to be due to damage to the cellulose molecule itself. Research has shown "that certain types of oxidation predispose cellulosic fibres so modified to further degradation by alkalis in degrees varying with the nature of the original degradation."

The situation is then outlined in the following terms: "The general consideration of this problem which is of interest to all users of cotton textile materials is that severe laundering treatments to which work clothing, and frequently shirts and underclothing are subjected, include the use of alkalis, and for white goods bleaching materials and sours. These types of chemicals are such that they may cause further degradation of the cellulose. The premise is offered for your consideration that by minimising the degradation of the natural cellulose fibres in preparation for dyeing, and in dyeing, and in the scouring and bleaching of white goods, the life of the article may be definitely increased."

Turner[10] (Jnl. Soc. Dyers & Col. 1935, 51,345) has explained these effects in the following manner: The conception of the cellulose molecule is a bundle of about 50 chains each of 100 to 200 glucose residues joined end to end. During acid treatment of cotton acid hydrolysis takes place and water is added at various points of the glucose chains, which are thereby made shorter.

The action of oxidising agents is probably at the primary alcohol group (CH_2OH) which is converted to a carboxyl (COOH) group. This would also result in reducing properties but without shortening of the glucose chain. These and other considerations offer some explanation of the chemical changes which take place in cotton processing.

Davidson[3] also gives the following interesting information regarding the strength of the cellulose fibre:

"The cellulose fibre owes its tensile strength to the great strength of the primary valency chains and to the additivity of the lateral cohesive forces along the chains that tend to prevent slipping of one chain on another when a longitudinal force is applied. When the chains are shortened the extent of their mutual overlapping is diminished so that the slipping of the chains and consequently rupture of the fibre occurs more easily. Thus copper number, fluidity, and tensile strength are all functions of the chain-length distribution, and are for this reason related to one another."

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(10) Turner: Oxidation of Cellulose. Jnl. Soc. of Dyers and Col., 1935, 51, 345.

Fashion Colours for Autumn and Winter 1959

The general trend shows a continuance of full. bright colours under the heading "Autumn Harvest." Months ago therefore designers and colourists were advised that the general trend was for a continuance of full, bright colours: that even the more muted wool tones would be brightened with stronger colour; that violet appeared to be shaking off all sad associations of mourning and would be shown, not only on wool and knitwear, but also on silk, man-made fibres and cotton, and also that something new in the way of reds would enable every woman to find a pink or red to suit her.

Amongst the 31 colours on wool six reds are important. London model houses have shown how effectively pink and red can be combined. Three new pink/reds give a red for every colour type: Sunkissed Pink is paired with Mulberry Wine; a glowing rose pink called Rambler Rose is paired with Hibiscus Red; Lucifer, a flaming rose red is shown with glowing Mexican Ruby. Reds and pinks for Autumn and Winter 1959 have a new luminous quality, very clear, light and gay, they show much greater variety than reds have shown before, sometimes running into light wine hues, at other times tinted with coral.

Silk and man-made fibres are closely allied with wool in present day manufacture and the colours on these two cards are closely co-ordinated. Amongst the 32 colours for silk and man-made fibres reds such as Maple Red and Currant Red run into coral types, Coral Glow and Sun Orange, and from there into orange and Berberis Gold.

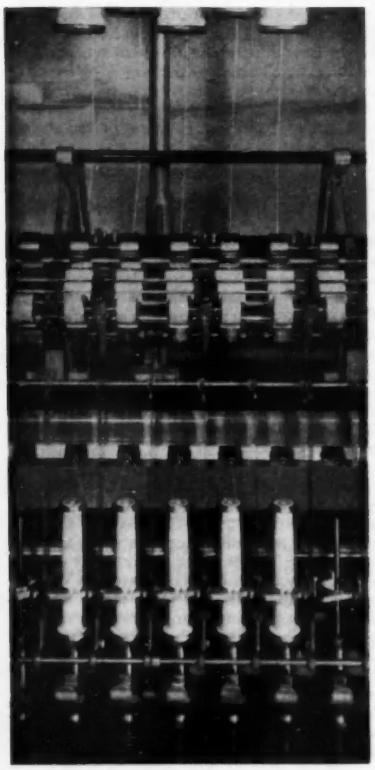
Cottons too, reflect the trend for full colours. There is a notable absence of "pale" pastels which are gradually being replaced by more colourful pastels. This is largely due to the increased use of white in cotton print designs which gives the same delicacy once achieved by pastels. While the wool and silk and man-made fibres charts show glowing orange versions of the Spring amber tones, the cottons have a pink bias noticeable in the dual tones, Coral Pink and Virginia Red, and to a lesser degree in Carnelian. Light "wine" colours have mellowed to Spinel Red, Strawberry Ice, Crushed Raspberry and Claret.

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

New Ringframe for Worsted, Synthetics and Blends

Simple to operate and easy to maintain, this new development has a draft range of 5 to 20 and includes needle bearing front rollers, quick release loading and other distinctive features

IN recent years quite a variety of new designs in spinning frames have been developed to give larger packages, higher drafts and higher speeds. The new frames are mainly the ring type and J. and T. Boyd Ltd., Shettleston Ironworks, Glasgow, have now brought forward a ring frame which has many novel features allied to maximum simplicity.

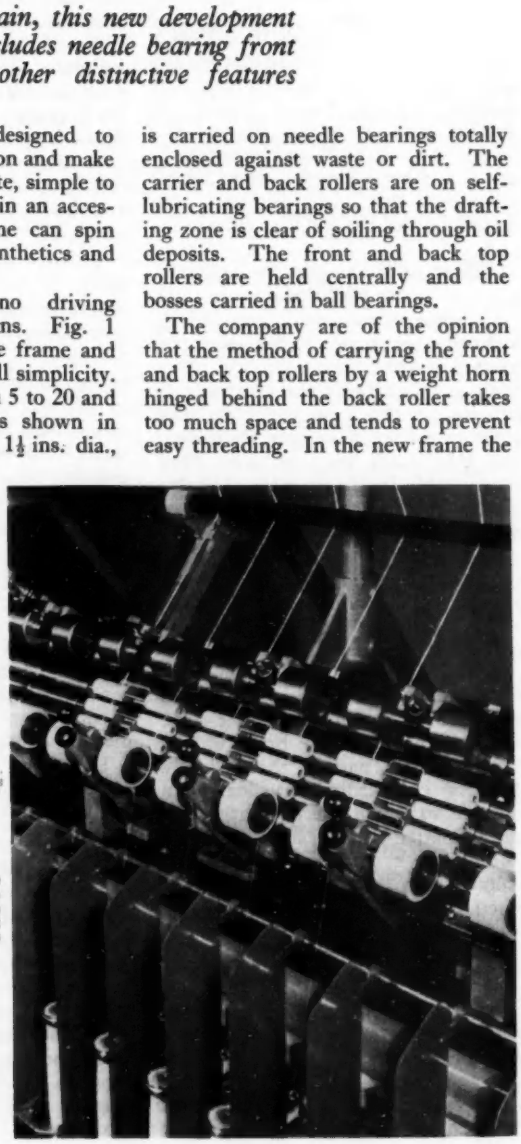


The frame has been designed to eliminate every complication and make the machine easy to operate, simple to maintain with every part in an accessible position. This frame can spin worsted (oiled or dry), synthetics and blends.

The machine has no driving cylinders, tapes or aprons. Fig. 1 shows a front view of the frame and clearly indicates the overall simplicity. The range of draft is from 5 to 20 and the roller arrangement is shown in Fig. 2. The front roller, 1½ ins. dia., is carried on needle bearings totally enclosed against waste or dirt. The carrier and back rollers are on self-lubricating bearings so that the drafting zone is clear of soiling through oil deposits. The front and back top rollers are held centrally and the bosses carried in ball bearings.

The company are of the opinion that the method of carrying the front and back top rollers by a weight horn hinged behind the back roller takes too much space and tends to prevent easy threading. In the new frame the

(left) Fig. 1. Front view of the frame



(right) Fig. 2. A close-up showing the roller arrangement. The draft range is from 5 to 20 and the front roller is carried on needle bearings

weight horn has been dispensed with, and a neat and efficient spring holder introduced for the front top roller, shown in Fig. 2, has a quick release so that pressure can be taken off the "Accotex" roller when the frame is standing. The back top roller is carried with an independent spring arrangement similar to the standard Bradford system. The frame can be ratched down to 4½ ins. with three rows of carrier rollers and up to 11 ins. With two rows of carrier rollers tha ratch can be reduced to 3½ ins. The speeds of the carrier rollers have been arranged to give the best drafting conditions.

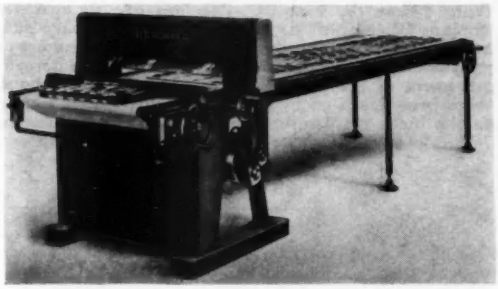
All rollers and bearings are manufactured to very fine limits so that the rollers are perfectly aligned and true. The angle of the roller stand has been raised so that the line of yarn from the rollers to the lappet guide allows the twist to run up to the roller nip. The conical type self-lubricating rings are claimed to give the best starting-up conditions and longer traveller life.

Cylinders and tapes have been dispensed with and the spindles are driven by an endless belt which imparts a powerful drive to the spindles without slippage. Each side of the frame is driven independently with separate motors.

The dividing plates are carried on a hinged rod below the spindles and are clear of the ring-rails. The plates are clipped in a catch and can be swung down so that the spindles and rings are open and easily cleaned. The plates cover the whole path of the yarn from the nip to the ring to prevent interference between adjacent spindles. The guide lappet above the spool or bobbin moves in conjunction with the ring-rail for a part of its length and so helps to equalise the changing balloon of the yarn.

Tests have shown that yarns spun on this frame are very level indeed. The width of the frame is only 3 ft. 2 ins., and the entire machine is easy to clean and maintain as all the parts are so accessible. Alteration of drafting length is simple and easy, and the ratch can be down to 4½ ins. with three carrier rollers, or 3½ ins. with two carrier rollers; the maximum ratch is 11 ins.

New Cutting Machine in Four Sizes



A NEW type of power-driven pattern cutting machine has been introduced by John T. Hardaker Ltd., Bowling Ironworks, Bradford 4. The model illustrated was specially designed with an extended back table fitted with a conveyor belt to feed the material up to a measuring fence for accurate cutting. The conveyor belt is operated by a rack and pinion which is attached to a rule which enables the desired amount of cloth to be brought forward. The measuring device can be brought away from the front of the machine to enable the cut length to be taken out without disturbance.

The standard machine is not fitted with the extended table and therefore does not require as much floor space as the one shown here. The standard machine is particularly suitable for the tailoring trade, where great numbers of seasonal samples require to be cut. The machine is electrically driven and is designed to stop at top-centre after each cut. This is to meet the factory regulations. To start the machine it is necessary for the operator to use both hands as the push-button switches are set wide apart. This is to safeguard the operator when the knife is descending and in addition a perspex guard lowers at the same time as the knife.

From 2½ to 3 ins. thickness of material can be cut at one operation for standard cloths but rather less for cotton, linens and synthetic fabrics. The machine can be supplied in four sizes—namely, 22, 30, 32 and 42 ins. It can be fitted with a plain edge knife or with a choice of fine, medium or coarse serration. Delivery is approximately 12 weeks for standard voltages.

F.N.F. Section Bobbin

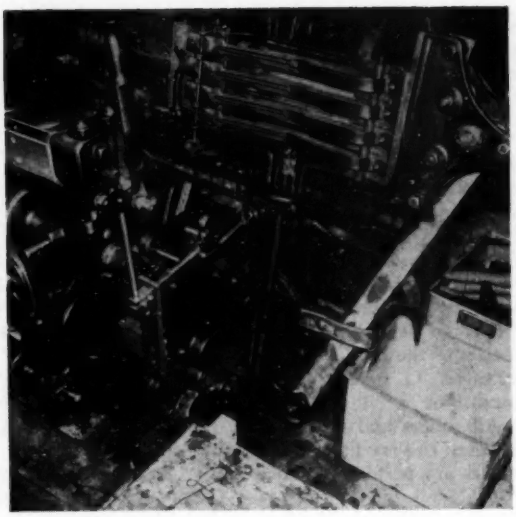
A NEW section bobbin for use in the warp knitting industry is announced by F.N.F. Machinery Manufacturing Co. Ltd., Burton-on-Trent. It is claimed to embody all the latest techniques evolved from good practical experience of the warping and knitting industries. The bobbin is manufactured as a complete unit in one piece.

Running trials are reported to have shown that 32,000 yds. of 30 den. flat nylon at a moderately high tension per end is well within the capacity of the bobbin and can be wound without any flange deflection.

Single unit construction, and the strength to resist extreme loadings ensure no danger of yarn trapping, a well-known problem when 15 den. monofilament yarn is warped. Furthermore, because of the increased strength of the flange root, and its integral construction with the core tube, problems associated with core shrinkage and reduction of barrel diameters are completely obviated. Fully warped bobbins can therefore be easily loaded on to mandrels or beam cores for use in the knitting machine. The dynamic balance of these bobbins makes high speed warping possible even at tensions as high as 12 - 15 grammes per end, a figure, it is pointed out, well above the average at present employed in the trade, and which makes the bobbins particularly suitable for rubber on elastic yarns. The inside edges of the flanges have been specially relieved to avoid damage, and therefore the need to clean off knocked or burred edges before warping is eliminated.

Bobbins are available in 21 ins. widths with either 14 or 21 ins. dia. flanges, for mounting on 4½ or 6 ins. dia. cores.

Stop-on-Pick for Dobcross Looms

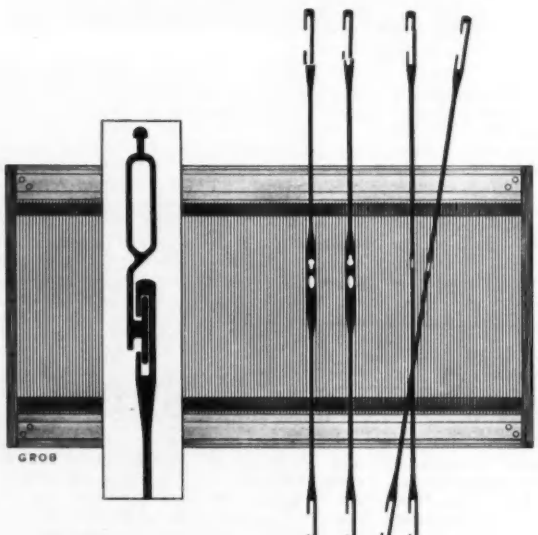


Dobcross loom fitted with Hudson's stop-on-pick motion

THE experience gained by Irvin Hudson Ltd., Ingleby Street Works Bradford in fitting over 100,000 looms with "Stop-on-Pick" brake motions has now been applied to the Dobcross type of loom. The motion consists of a centre weft-fork motion (single or double) driven from the breast rail on every pick. The motion is transmitted to a shutter mechanism on the bottom of the box which, when the loom is running, moves out of the way of a projection on the brake mechanism. When the weft breaks, the shutter does not move and strikes the brake mechanism, knocking-off the starting handle and, with the forward movement of the slay, applying the brake. The loom stops up to 2 ins. from front centre before the beat-up. The load of stopping the loom is split between a brake band on the handwheel of the top shaft and a bracket resisting the forward movement of the going part, any excess shock being taken up by a shock-absorber on the brake mechanism.

The weaver releases the brake and the slay moves easily to back centre under its own weight. The weaver removes the broken pick, throws the shuttle across and continues to weave. The brake mechanism is automatically re-set after the first pick when the absence of weft under the forks would not stop the loom. The weaver does not have to manipulate the dobby, take-up or let-off, the boxes or any other mechanism. Loom stoppage time is reduced to a minimum and there is no risk of a fault due to inexperience on the part of the weaver. The weaver's job is considerably lighter and she does not have to watch the shuttles to catch them before they run-off. The weaver can attend up to four looms in woollens and up to six looms in worsteds.

Light-weight Metal Heald Frame



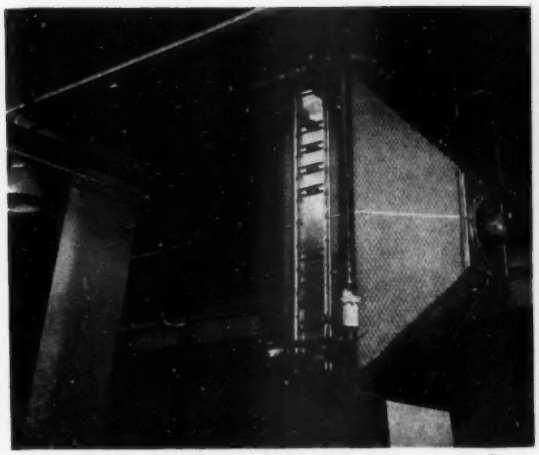
Section of the new Grob lightweight heald frame

WEIGHT, strength and dimension are three of the most important considerations in textile machinery components and in no single instance are these more important than on modern, high-speed, precision-built looms. In this connection a new development announced by Grob and Co. Ltd., Horgen, is the "Grobtex" light metal heald frame which has been designed for use with "Grobtex" healds and the so-called keyhole healds required for use with the Barber-Colman automatic drawing-in machine.

The light metal frame staves are hollow-drawn with the well-known T-bar on the outer edge to accommodate the movable raising and lowering hooks and one side of the stave is extended towards the centre of the frame to allow for direct fixing of the nickel-plated heald rod. The low-built frame gives the weaver free viewing and unhindered action when drawing-in warp ends. The heald rod, firmly rivetted to the side of frame stave or the connecting plates, increases the stability of the frame substantially.

To ensure that the healds with end loops open on one side can glide freely on the broad heald rods, the distance between the upper and lower rods must be equal over the whole frame length and the precision-made light metal frame fulfils in every respect. It is immune against changes in humidity and the lignostone side supports prevent the staves grazing each other at the shed change. For threading and removal of healds, both ends of the heald rod can be pulled forward but in working position they are secured by a pin under spring pressure. This catch can be released by a slight pull and the end of the heald rod is easily raised. Simultaneously the locking pin springs back into position and lies on the front edge of the side support. As the heald rod is also secured in the forward position, the healds can speedily be mounted or removed. When the locking pin is drawn backward, the heald rod springs into working position. (The representatives in this country are M. H. Spencer Ltd., Priory Mill, Coventry and Samuel Smith and Son (Healds) Ltd., Eccleshill, Bradford).

New Model Air Spin Textile Drier

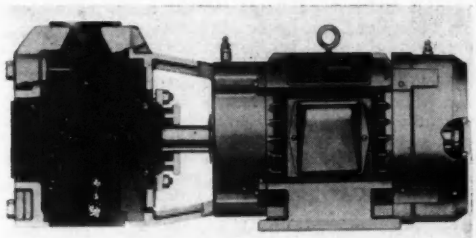


The Wall 54-in. air spin drier at work in vertical position

THE latest development in the range of equipment marketed by Wall and Co. (Bolton) Ltd., Bradford Buildings, Mawdsley Street, Bolton, Lancs., is the moderately priced air spin drier specifically designed to meet new trends in textile finishing operations. A feature of the unit is that it can be placed wherever needed, horizontally or vertically, auxiliary to a stenter, or to heat cloth before or after dyeing, or for drying printed goods coming off a roller printing machine or a screen printing unit.

As will be observed from the photograph, the machine is composed of two independent halves, specially designed in aerodynamic form to minimise air "drag." Between these the cloth passes without touching, and the drying air spins in a complicated and highly efficient manner which gives continual re-heating of the air cooled by the cloth on both sides. The working length is 72 ins., the width may be anything required. It runs economically on steam, and achieves an evaporation of 4 - 5 lbs. per sq. ft. per hour. Where steam pressures are lower than average, or when temperatures up to 250°C. are desired, it can be boosted by electrical heating. The installation shown is a 54 ins. model at work in a vertical position.

Corrosion-Resistant Centrifugal Pumps



THREE new sizes of corrosion-resistant centrifugal pumps—two with nearly twice the capacity of present models—have been added to the line of Karbate impervious graphite pumps available from Union Carbide International Co., Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y., U.S.A. Increasing use of this motor-mounted type "F" pump in the chemical and metal finishing industries in the U.S. has created a demand for a greater capacity range, both in terms of total head and galls./min. ratings. Known as models 22-FAL, 28-FAL, and 31-FAL, the new pumps are equipped with 1, 1½ and 2 h.p., 1,750 or 1,450 r.p.m. motors. At 1,750 r.p.m., the latter two types can deliver up to 150 galls./min. compared to a top of 80 g.p.m. for previous type "F" Karbate impervious graphite pumps.

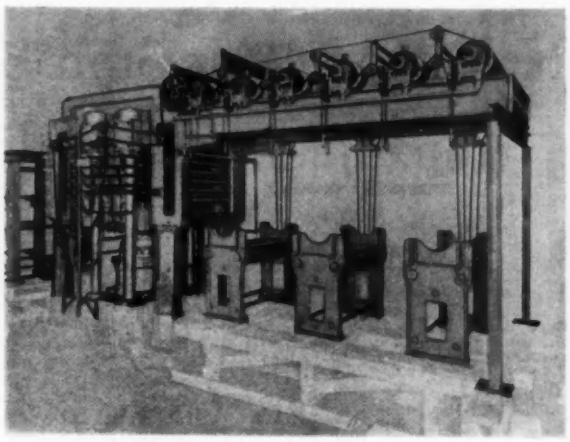
The two larger pumps are available with 3 or 5 h.p. motors for handling fluids of higher specific gravity than water. Maximum total head for each of the new types operating at 1,750 r.p.m., is 33, 51 and 67 ft. respectively (10·1, 15·5 and 20·4 meters); at 1,450 r.p.m. maximum heads are 22, 34 and 45 ft. respectively (6·7, 10·3 and 13·7 meters). The almost universal corrosion-resistance of Karbate impervious graphite pumps makes these low-cost units excellent for a wide range of applications, and permits an appreciable reduction in inventories through the standardisation of pumps and replacement parts.

Speed Regulator for Compressed Air Cylinders

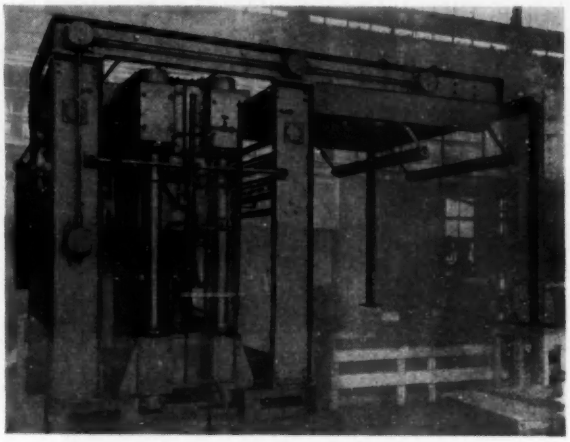
View of the speed regulator

A NEW speed regulator for use with their compressed air cylinders is announced by Baldwin Instrument Co. Ltd., Dartford, Kent. These new units are an improved development of the earlier micrometer type, and have a regulation of at least three times that of the previous model. The bore sizes are ¼, ½, ¾ and 1 in. The new regulator is slightly larger, and utilises the same two-piece construction as its predecessor. The unit is made from anodised duralumin. A friction device incorporated in the body of the regulator prevents the micrometer adjustment being disturbed by vibration.

Where the speed of movement of an air cylinder is required to be different in each direction of movement, the new regulator is a simple means of producing this. This regulator screws directly into the exhaust ports of the directional control valve, and thereby throttles the escape of air from the exhaust end of the cylinder. Where steadiness of motion is required, this method of speed regulation is to be preferred. All these new regulators are screwed B.S.P. (parallel series), to conform with nominal bore size, and it is recommended that they should be sealed to the valve body by the use of soft metal washer or bonded seal. The maximum working pressure for all these regulators is 150 p.s.i.



Hattersley Pickard automatic flat plate pressing machine. Type "CR", size 42 ins - 6 gap



Hattersley Pickard automatic flat plate pressing machine. Type "XW," size 66 ins. - 2 gap

Cloth Finishing Presses

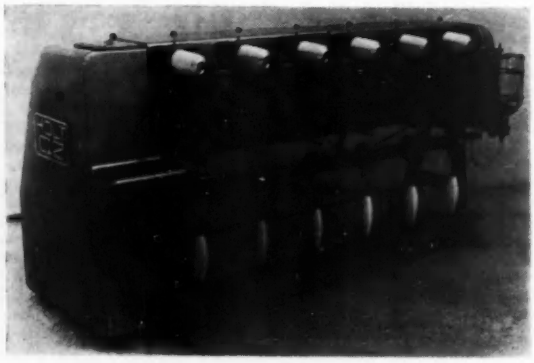
THE latest automatic cloth press made by Hattersley Pickard and Co. Ltd., 123 Jack Lane, Leeds 10, is designed to provide the ideal solution to obtaining the very highest quality finish coupled with a high rate of output at a low operating cost. The type "CR" press is designed to handle cottons, rayons and other light piece goods and is manufactured in sizes to handle cloth widths of up to 60 ins. at a continuous output of 1,500 yds./hour. The type "XW" press is designed for woollens and worsteds and is suitable for cloth widths of up to 64 ins. at a continuous output of up to 750 yds./hour.

The quality of finish obtained is claimed to be equal of that produced by the finest hand processes but with the added advantage that all creases, paper edge and cuttle marks are eliminated. This method being quite distinct from the rotary or calendar system applies pressure when the cloth is stationary, thereby eliminating any tendency towards stretching. The cloth on being fed into the machine is arranged between heated press surfaces in a multi-fold layer, each layer being separated by press papers. When in action, the pressing cycle is intermittent, the application of pressure and the conveying of the cloth being accurately controlled.

The cloth is pressed by applying pressure through the main ram to the heated platens. After a pre-determined time limit, pressure is released and the platens fall fully apart; the pressed cloth is then drawn forward to an exact length and brought to rest allowing the previously untreated section to be pressed. This cycle is repeated four times each minute, the entire operation being fully automatic throughout.

Precision Winder for Fine Yarns

SPECIFICALLY designed to wind the finest denier synthetic yarns the Model Q.2 precision cone and cheese winder, manufactured by Thomas Holt Ltd., Rochdale and Darwen, offers very high accuracy in the control of pressure between package and roller bail and is an important advance in the production of consistently uniform packages of any predetermined degree of density, on yarns from the finest to the heavier deniers. Control of yarn tension is highly sensitive and its application progressive and gradual regardless of the degree of tension required. A constant yarn speed is maintained throughout the build of the package and the machine requires no tension variation attachments.



Model Q2 precision cone winder (Thomas Holt Ltd.)

A fully patented pressure control arrangement allows the pressure of the roller bail against the package face to be pre-set as required, even to the point of balance. Once set, the pressure is consistently and accurately maintained. Positive movement of the package away from the roller bail during building-up is achieved through gearing, the action being independent of any change in denier or tension of the yarn. The yarn line runs from the supply through the tension to the package and is kept substantially straight throughout winding, the absence of acute angles reducing strain on the yarn.

A self-threading traverse guide controls the lay of the yarn close up to the package, the traverse being easily set and controlled to give packages of equal or unequal taper. Ratio of traverse speed to spindle speed is adjustable and the wind can be made open or closed. When required, the wind will remain open throughout the package so there is no pluck or drag on adjacent layers during unwinding.

THE TEXTILE
COLOURIST & FINISHER

Interesting Aspects of Dye Absorption and Control in Dyeing and Printing

Level dyeings are most likely to be produced if the dyes can be induced to be absorbed at a fairly uniform rate throughout the middle part of the dyeing process and at reduced stages in the earlier and later stages

By B. C. M. DORSET

THE success obtained in dyeing and printing is largely governed by the control exercised over the way in which the fibres absorb the applied dyestuffs. So far as possible it is important to secure an even absorption of dye and to arrange that this absorbed dye becomes uniformly absorbed throughout the fibre substance. If these requirements are satisfied then the dyed material will have a satisfactory appearance and the fastness properties will be as high as the particular dye employed allows although in respect of fastness something can be done further to improve this by an after-treatment designed to aggregate the dye particles within the fibres so that they acquire an optimum size. It is thus evident that dye absorption is a most important feature of dyeing and printing procedures.

From early times it has been recognised that the preparation of textile material for dyeing influences the subsequent dyeing processes and it has well been said that "a well prepared fabric is half-dyed." All yarns and fabrics as they reach the dyer and printer contain impurities (either natural or added to aid spinning, weaving, etc.) which can interfere with dye absorption and it is generally necessary to remove these by scouring and bleaching treatments. In the case of cotton, purification may be followed by mercerisation not only to confer increased lustre but also to give it an enhanced affinity for most types of dyes applicable to cellulose fibres. In carrying out these preparatory treatments it is important not only to secure adequate purification of the fibres but also to avoid uneven modification of the fibres especially by chemically or mechanically damaging them since this will inevitably lead to uneven dyeing and the production of coloured materials having inferior fastness properties.

In the dyeing and printing process itself dye absorption can be controlled by a number of different methods including the physical conditions of dye application (temperature, dye concentration, time, steaming, etc.) but here we are concerned more particularly with the addition to the dyebath or printing paste of substances which are often termed dyeing assistants or dye adjuvants and of which there are today a very large number mainly provided by the manufacturers of organic chemicals based on coal tar and petroleum raw materials. Throughout the many years during which the so-called coal tar dyes have been used the nature of the dyeing assistants available has steadily become more complex and their uses have tended to become more specialised. The number of these dyeing assistants has steadily increased to meet the needs of dyers who have in recent years had to process new types of fibres, especially the synthetic fibres such as "Orlon," nylon, "Terylene," etc. It is probably true that without modern dyeing assistants the colouring of these new fibres could not have been satisfactorily carried out.

In the early days of dyeing the main dyeing assistants were common salt and glaubers salt (the former accelerates the dyeing of cellulose fibre goods with direct cotton and other dyes while the latter retards the dyeing of wool with acid dyes), soaps (to retard the dyeing of cotton), sulphuric and acetic acids (to accelerate the dyeing of wool), and mild alkalis such as ammonia to exert various effects according to the particular dyes employed. These assistants are still very largely employed but their use is widely supplemented by the large number of more complex assistants now available.

From many years' experience in the application of dyes to textile materials it has become recognised that the following features of dyeing are important in the production of satisfactory dyeings:—

(1) Control of rate of dye absorption.
(2) Securing a high degree of exhaustion of dye from the dyebath.

(3) **Ensuring that the dye passes into the interior of the fibres and that in the dyed fibre it is not mainly present in the fibre surface ("ring dyed")—many dyes tend to give "ring dyed" fibres.**

(4) **That there is little dye left adhering loosely to the fibre surfaces.**

(5) **That any unevenness of dyeing resulting from uneven contact of the textile material with the dye liquor in the initial entry of this material shall gradually correct itself during the later stages of dyeing by a migration of dye from the more deeply coloured parts of the textile material to those less heavily dyed.**

(6) **That the conditions of dyeing shall, as far as possible, induce the dye to become absorbed evenly throughout the textile material even when this is not of uniform quality to a degree that it tends of itself to absorb dyes unevenly.**

(7) **The state of division of the dye particles and whether they are dissolved or dispersed or suspended in the dye liquor.**

The above list is by no means complete and could easily be extended. It is also possible to let each item occupy an article to itself. So here it will have to suffice to draw attention to those features of recent and particular interest.

Turning first to the rate of dyeing it will generally be accepted that level dyeings are most likely to be produced if the dyes can be induced to be absorbed at a fairly uniform rate throughout the middle part of the dyeing process and at reduced rates in the earlier and later stages. The lower rate of dye absorption in the earlier stages is desirable since it usually occupies up to 10 minutes to bring the textile material uniformly into contact with the dye liquor; slow dye absorption is also desirable towards the end of the dyeing process so that there is ample opportunity for the dyer to take samples and adjust the dyebath to produce a shade which matches the pattern—this would be difficult if the material was absorbing dye at a high rate. During the latter stages of dyeing it is also desirable that there should be opportunity for dye migration with consequent levelling of shade to take place yet without appreciable further absorption of dye. Since many dyes do not naturally dye in this manner what are the expedients which can be used to induce them to do so? The use of common salt, mild alkalis, Glaubers salt, and sulphuric and acetic has already been mentioned in connection with the dyeing of cotton and wool but what are some of the more modern expedients?

Among present day dyeing difficulties such as often encountered are (*a*) the dyes applied are absorbed too slowly and (*b*) the applied dyes are absorbed too rapidly. A well known expedient for accelerating dye absorption is to employ a high dyeing temperature but in this case it is possible that if a certain high temperature is exceeded then the rate of dye absorption becomes lower. But another method is that of having present in the dye liquor a substance which is capable of swelling the fibres —this has in recent years become an important aid to dyeing. Several instances can be given of this.

Fibre-Swelling Agents

Acetate fibres have scarcely any affinity for most acid wool and direct cotton dyes. If however the dyeing of these fibres is effected in a dye liquor prepared so as to contain a high proportion of ethyl alcohol then the resulting fibre swelling favours the rapid absorption of these dyes. Moreover when the dyed fibres are washed with water so that the fibres lose their swollen condition then the dye particles entrapped within the fibres cannot be readily removed by ordinary washing treatments and the coloured acetate material has quite good fastness although there can be but little affinity between fibre and dye. But an important aspect of this method of dyeing by use of a fibre-swelling agent is that it allows acetate goods to be dyed very rapidly and in fact this method of dyeing can be used as the basis of continuous dyeing processes. To counteract the usual slow dyeing nature of acetate fibre goods in dyeing and printing much use is now being made of dye assistants which have this property of swelling the acetate fibres —many of these assistants are in their pure form solvents for the fibres so that they have to be employed in a diluted form such that they swell rather than dissolve.

The addition of substances able to swell nylon, for example beta-naphthol, phenol, cresol, etc., to the dyebath can be an effective method for accelerating the rate of dyeing of this type of fibre. It will be noticed that the use of fibre-swelling agents to accelerate dyeing is mainly confined to the hydrophobic fibres such as acetate and the synthetic fibres. This follows from the fact that these fibres do not appreciably swell in water as do the natural fibres such as cotton and wool. Fibre swelling as produced by water with the natural fibres is obviously very fortunate for the dyer of such materials—it makes unnecessary the addition to the dyebath of relatively expensive organic chemicals to effect this swelling.

While the use of fibre swelling agents can do much to assist rapid dye absorption there is an adverse result. The fibre-swelling agent is not always easy to wash out of the swollen dyed fibres and if it is left there a possibility arises that the combination of fibre, dye, and swelling agent may be less fast to light than when the swelling agent is absent. Instead of having the fibre-swelling agent present in the dyebath at the same time that the dye is being applied it is sometimes more convenient to pre-treat the textile material with the swelling agent; dyeing can then follow. According to B.P. 803,774 the rate of dyeing of "Terylene" can be much increased by a pre-treatment of the yarn or fabric with a boiling dioxane say for about 30 mins.

Another recent use of a fibre-swelling agent to assist the dyeing of polyester fibres by disperse dyes has been described in B.P. 789,333 and it involves the addition of trichloroacetic acid to the dye liquor; a wetting agent such as Lissapol C (I.C.I.) should also be present. It is recommended that preferably 2 to 10 parts by weight of the trichloroacetic acid should be present per 100 parts of dye liquor. Thus a bright orange shade of good depth can be obtained by dyeing the polyester material at 80°C. for 20 mins. in 500 parts of a liquor containing one part of 1-amino-2-methylanthraquinone (the dye) and 1½ parts of trichloracetic acid whereas without the addition of the trichloroacetic acid only slight staining is obtained.

Another expedient for influencing the rate of dye absorption with a view to securing more evenly dyed shades involves having present in the dye liquor a substance which is naturally attracted into the fibres so that it either restrains or enhances their simultaneous or subsequent absorption of the applied dyes. In the dyeing of wool this expedient has been utilised over many years by the use of Glaubers salt and the explanation of its beneficial effect can be briefly described thus.

In an aqueous dye liquor the sodium sulphate ionises to give sodium cations and sulphate anions while the dye (assuming it to be an acid wool dye and to consist of the sodium salt of say an azo dye made water-soluble by the presence of a sulphonic acid group) ionises to give sodium cations and dye anions as in Fig. 1.

Fig. 1

The basic character of wool fibres gives it the power to absorb anions preferentially and since the sulphate anions are usually much smaller and therefore more mobile than the dye anions the former are readily attracted to the wool and so become absorbed before the dye anions. The result of this is that in the early stages of dyeing the acid wool dye is absorbed more slowly than it would be were the Glaubers salt not present and this favours level dyeing. Towards the middle and end stages of dyeing the dye anions gradually displace some of the absorbed sulphate anions and so the dyeing of the wool continues at a satisfactory rate. The power of the dye anions to displace the sulphate anions from the wool must arise from some special attraction between the wool and the dye and which does not exist between the sulphate anions and the wool.

In many ways nylon behaves similarly to wool in respect of its dyeing behaviour towards acid wool and direct cotton dyes. Thus the presence of sodium sulphate in the dye liquor can hinder dye absorption. If the sodium salt of a benzene or naphthalene sulphonic acid be used instead of the sodium salt of sulphuric acid then the first absorbed anions from these aromatic sulphonates can be more effective than sulphate anions and actually prevent the nylon from absorbing any of the applied dye so that the nylon is left white. Other similar substances having this same resist power include Lissapol LS (I.C.I.) which is sodium oleyl-para-anisidine sulphonate and Nekal BX (I.G.) which is the sodium salt of a dialkyl naphthalene sulphonic acid.

The above observations indicate how a colourless aromatic sulphonate can reduce the absorption by nylon of acid wool dyes and some direct cotton dyes (these latter behave towards a protein fibre such as wool and nylon as do the acid wool dyes which are similar in chemical structure in so far as both types of dye owe their water-solubility to the presence of sulphonic acid groups). It might therefore be expected that since these aromatic sulphonates cannot owe their resist properties simply to their possession of colour there is the possibility that when a mixture of acid wool dyes is applied to nylon one or other of these could restrict the absorption of the others and so give a kind of coloured instead of a colourless resist. This special kind of resist can actually be observed and it can be the cause of serious dyeing difficulties. This phenomenon is usually termed "dye incompatibility and because of it dyers find it difficult to foresee exactly what shade will be produced from a mixture of dyes. If, for example, *wool* is dyed with a certain mixture of three selected acid wool dyes each of these will be absorbed as if no other dye were present in the dye liquor and a certain shade will be produced corresponding to the proportions of these dyes added to the dye liquor. But if *nylon* instead of wool is dyed with the same dye mixture it is likely that quite a different shade may be produced owing to the fact that one of the dyes is preferentially absorbed to the partial exclusion of one or both of the others. Since this preferential dyeing will be affected by the dyeing conditions it could happen that with two successive dyeings the conditions employed in one being different from those in the other two different shades could be produced in spite of the fact that the same proportions of dyes were employed. Shade matching could thus be made extremely difficult.

Investigations of this incompatibility of dyes for nylon has indicated that it is largely due to the fact that nylon has a much less capacity than wool to combine with acid wool and direct cotton dyes so that there is a much keener competition among the applied dyes for the limited number of dyeing sites available in nylon fibres. These dyeing sites are the free amino terminal groups and also the amide groups regularly spaced along the nylon molecule. It is possible to prepare modified nylon fibres having a higher proportion of dyeing sites and it is then found that this type of nylon dyes much more normally and more like wool with dyes which are found to be incompatible with each other in respect of ordinary nylon.

"Cuprous-ion" Method

Another method for modifying the dye absorption by textile fibres, especially those of the acrylic type, involves the addition to the dyebath of copper in the form of cuprous ions. This method, now known as the "cuprous-ion" procedure for colouring such fibres as dynel, "Orlon," etc. is based on the fact that such fibres have the power to absorb cuprous ions which in their turn are then able to attract acid wool and direct cotton dyes into the fibres thus allowing this type of fibre to be dyed with dyes not otherwise satisfactorily applicable to it. At one time the cuprous-ion procedure for the dyeing of acrylic (that is, acrylonitrile-containing) fibres became very important for it was discovered at a time when the dyeing of such fibres was much more difficult than now. However improvements in this special method of dyeing are still being made.

The original method consisted of treating the acrylic fibre goods in an acid dyebath containing copper sulphate and a reducing agent to reduce the former substance and provide cuprous ions. Conditions of temperature and copper sulphate concentration have to be arranged so that a suitable amount of copper is absorbed into the fibres—if too much is absorbed or if the reduction is excessive then the fibres can acquire an objectionable copper colour. The choice of a reducing agent can also be important and among such agents as sodium hydrosulphite, formaldehyde sulphoxylate, sodium bisulphite, etc., it was found that hydroxylamine sulphate was generally superior. An important feature of this method of dyeing is that it allows the production of deep shades with a number of acid wool and direct cotton dyes at temperatures up to the boil whereas without the use of copper sulphate these dyes would yield only pale shades—to obtain deep shades with such dyes it would be necessary to employ dyeing temperatures exceeding 100°C. and thus require the use of enclosed pressure-dyeing equipment.

In recent years improved or alternative forms of this cuprous-ion dyeing process have been introduced. Thus the Sandocryl process effects the reduction of the copper sulphate by having metallic copper gauze or strips in the dyebath. A more recent improvement which can have only special applications involves the formation of cuprous ions by a process of electrolysis. For this there is provided in the dyebath an unoxidisable steel wire netting cathode and another such anode while the dye liquor consists of a solution of copper sulphate having a pH of 2 to 3. Dyeing is carried out at about 100°C. and during the process an electric current is passed through the dye liquor corresponding to a current density of 0·10 to 0·20 amps per sq. dm. at the anode. This electrolytic procedure results in the formation of cuprous ions within the dye liquor and their amount can be controlled by the magnitude of the electric current so as to avoid deposition of copper at the cathode. This method of dyeing thus depends on cuprous ions but it does not require the presence in the dye liquor of an added reducing agent such as hydroxylamine sulphate.

It is known that basic dyes and dyes containing iso-thiouronium or quaternary ammonium salt groups (these include chloromethyl derivatives of phthalocyanines and of some anthraquinone vat dyes after they have been reacted with tertiary amines or thioureas) have only a moderate affinity for cellulose fibres such as cotton and viscose rayon so that it is necessary for the production of satisfactory deep shades on this fibre to assist dye absorption by special means. For example, in dyeing cotton with basic dyes it is generally necessary first to mordant the cotton with tannic acid or a sulphurised phenol product since these substances have a high affinity for basic dyes. A recent development (B.P. 800,735) now consists of treating the cellulose fibre material with a slightly acid solution of a mixture of a polyacrylic acid and the sodium or ammonium salt of this, then preferably dry and dye by a dyeing or padding method, and then neutralise by treatment with sodium bicarbonate solution. It is claimed that by this method much deeper dyeings can be secured and yet be free from loosely adhering dye so as to be fast to rubbing under wet or dry conditions. This new method can be used for dyeing with such basic dyes as Magenta PNS, Victoria Blue BS, and Methylene Blue 2BS as well as phthalocyanine dyes as for example the dye obtained by reacting copper tri (chloromethyl)-phthalocyanine with tetramethylthiourea.

In a typical dyeing process the treating liquor is prepared by dissolving 0.5 parts of a polymer of acrylic acid in 99·5 parts of water after adding sufficient caustic soda for the resulting solution to have a pH of 5·7. Cotton fabric is padded with this liquor so as to have a 100% liquor pick-up and is then dried. Then 100 parts of the dry fabric are thoroughly rinsed in water (residual insolubilised polymer is left in the fabric and it has an affinity for the types of dyes noted above) and introduced into 5,000 parts of a dye liquor containing 1½ parts of the particular phthalocyanine dye described above. Dyeing is carried on at the boil for 30 mins. after taking the same period in raising to this temperature and throughout the pH is maintained at 3·5 by suitable additions of acetic acid. The fabric is then removed, neutralised in a boiling dilute solution of sodium carbonate, and is then thoroughly washed with the aid of a non-ionic detergent so as to remove any loosely adhering dye. In this dyeing procedure 1·25 parts of the dye are absorbed by the cotton whereas if the treatment with the polyacrylate is omitted then the absorption is only 0.6 parts of dye. If cotton fabric is similarly dyed but with the basic dye Victoria Blue BS then it is possible to secure twice as high a dye absorption as when no polyacrylate is used.

A suitable polymer of acrylic acid may be made by catalytic polymerisation of acrylic acid and so that a 1% solution of the resulting polymer in 8% caustic soda solution at 20°C. has a viscosity of 2·4 centipoises.

Response to Cationic Dyes

Some very interesting features concerning the way in which the absorption of dyes can be influenced by additions to the dyebath are to be observed in the dyeing of "Orlon" with that basic type of dye which is now termed "cationic." It may be recalled that basic dyes such as Magenta, Rhodamine B and G, Methylene Blue, etc., were among the first coal tar dyes to be manufactured on a large scale and although they yield very brilliant shades they have tended in recent years to be replaced by faster dyes in the dyeing of both cellulose and protein fibres. Because of their poor fastness to light they were not considered suitable for dyeing polyacrylonitrile fibres such as "Orlon" until the discovery was made that if applied in a special way the shades yielded had, on this type of fibre, excellent fastness to light and washing.

This discovery has resulted in the discovery of many new dyes basic in type and containing a quaternary ammonium grouping so that the dyeing of "Orlon" has now been much simplified. A characteristic of these cationic dyes is that they have no strong affinity for "Orlon" below temperatures of about 90 to 95°C. but then they become very rapidly absorbed so that even dyeing, especially in pale to medium shades, becomes difficult. Thus it has become necessary in using these dyes to have present in the dyebath a dye-restraining agent. With the aid of such an agent the application of cationic dyes to "Orlon" and similar fibres has become important and now several dye makers are providing ranges of cationic dyes and suitable restraining or dye-retarding agents. The dyeing of "Orlon" has recently been somewhat complicated by the replacement of some older types such as "Orlon" 42 and 81 with a special type "Orlon 42" which is not only whiter in colour but which has a more pronounced affinity for cationic dyes. Thus it has been necessary to consider more carefully the dye-retarding agents which can most satisfactorily be employed to control dye absorption.

It may be noted that in order to make "Orlon" and similar polyacrylonitrile fibres more responsive in dyeing to cationic dyes it is necessary to adopt means quite the opposite from those employed for giving such fibres an increased affinity for acid wool and direct cotton dyes. It may be recalled that modified polyacrylonitrile fibres are now available with these latter desirable dyeing properties and they are mainly obtained from the usual fibre-forming copolymers containing a preponderance of acrylonitrile by further copolymerisation of these with a basic substance such as vinylpryidine —the fibres thus have the basic properties which are required to give them an affinity for acid wool dyes. But in the case of the special "Orlon 42" which is required to have an enhanced affinity for cationic (basic) dyes it is necessary that the fibres have a more acidic character—probably this has been obtained by introducing acidic groupings into the fibre-forming copolymer by a process of copolymerisation to produce a graft copolymer.

The idea behind most of the dye retardants so far made available for use in applying cationic dyes to "Orlon 42" is that the retardant should act as a colourless dye able to be absorbed by the "Orlon" just as the coloured cationic dyes are absorbed—thus in the dyebath there will be competition between the cationic dye and the dye retardant for absorption by the "Orlon" fibres. Since the cationic dyes yield in aqueous solution coloured dye cations it will be desirable for the dye-retardant also to yield surface-active cations. It thus becomes necessary to compare the dye-retardant powers of many cationic surface active substances and select those most effective and otherwise suitable. Cohen and Endler (Amer. Dyes. Rep., 1958, **47**, 325) have carried out such an investigation but before considering their interesting results it will be useful to refer to an earlier research by Neary and Thomas (Amer. Dyes. Rep., 1957, **46**, 625 *P*) concerning the use of a particular dye retardant (Du Pont retarder LAN) and its influence in the dyeing of an earlier type of "Orlon 42" and the special more-dyeable type "Orlon 42" with the Du Pont Sevron range of cationic dyes which are now available and cover the whole colour spectrum.

The usual dyeing procedure for applying Sevron dyes involves setting the dyebath at 120 to 140°F. with the following ingredients:—

0·3 to 0·5% of sodium acetate,
5 to 10% of anhydrous sodium sulphate,
0 to 6% Du Pont retarder LAN (for the older type "Orlon 42") or
0 to 3½% of Du Pont retarder DO (for the special more dyeable type "Orlon 42").

0·5% of a non-ionic surface active agent such as Alkanol HC (Du Pont) and sufficient acetic acid to bring the pH to 4·5 - 5·5 for most Sevron dyes, although a limited number can be dyed at pH 4·5 to 8·0.

Dyeing is carried out at as near to 212°F. as possible since at substantially lower temperatures the rate of dyeing is quite slow. With ordinary "Orlon 42" a drop of 5°F. can double the dyeing time required to produce a given depth of shade (see Fig. 2).

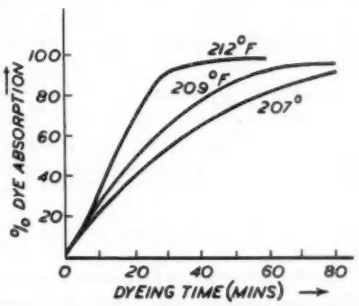


Fig. 2. Curves showing effect of lowering of the dyeing temperature on dye absorption (Sevron Brilliant Red 4G) by "Orlon 42" in the presence of Du Pont dye retarder LAN.

The proportion of dye retardant required is the greater as the proportion of dye applied is less. Thus, using Du Pont retarder DO the amounts of dye and retardant employed to ensure level dyeing should be as follows:—

% Sevron Cationic Dye Applied	% Du Pont Retarder DO
Less than 0·1%	5·0 to 4·0%
0·1 to 1·0%	4·5 to 2·5%
1·0 to 3·0%	2·5 to 1·25%
3·0 to 5·0%	1·25 to 0·5%
Exceeding 5%	0·5 to none

The manner in which a dye retardant such as Du Pont retarder LAN can restrain dye absorption by the more dyeable type of "Orlon 42" so as to bring it more in line with the older less dyeable "Orlon 42" is shown by the curves in Fig. 3. The dye absorption curve for the special "Orlon 42" is much steeper than that for the ordinary "Orlon 42" although both types of fibre are dyed in the presence of 6% of

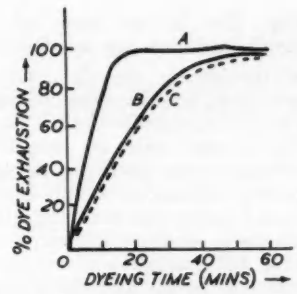


Fig. 3. Curves showing the rates of dye (Sevron Brilliant Red 4G) absorption for the more dyeable type of "Orlon 42" in the presence of (A) 6% of Du Pont dye retarder LAN and (B) 10·5% of the same dye retardant, and for ordinary "Orlon 42" in the presence (C) of 6% of the same dye retardant

Du Pont retarder LAN. It requires the proportion of the dye retardant to be increased to 10·5% to modify the dye absorption by special "Orlon 42" so that it is similar to that of ordinary "Orlon 42."

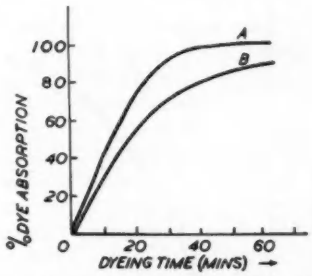


Fig. 4. Curves showing absorption of Sevron Blue B at 212°F. by the more dyeable type of "Orlon 42" in the presence of (A) 4% LAN and (B) 4% of the same dye retardant and 10% of sodium sulphate

In dyeing the special "Orlon 42" with a cationic dye such as Sevron Brilliant Red 4G at 212°F., it is found that the presence of 10·5% of retarder LAN has only the same dye retarding power 3·5% of retarder DO. But it has to be remembered that the sodium sulphate recommended as an addition to the normal dye bath can also exert a restraining influence on dye absorption and thus promote level dyeing; this can be seen from the dye absorption curves shown in Fig. 4. However sufficient and satisfactory control of dye absorption cannot be obtained by the use of sodium sulphate alone—the cationic dye retardants are also required.

It is now convenient to return to the investigations of Cohen and Endler previously mentioned. These workers carried out dyeings mainly with 1% of Sevron Green B in the presence of 1% of sodium acetate and 4% of acetic acid and the same proportion of a large number of dye retardants taken one at a time—during each dyeing the progressive exhaustion of the dye bath was determined photometrically so that the progressive dye absorption by the more dyeable type of "Orlon 42" could be calculated. The dye retardants employed could be classified into three main groups (Figs. 5 - 8):—

(*a*) *Long-chain primary amines, including—*

Fig. 5

$C_{10}H_{21}NH_2$ *decylamine*
$C_{12}H_{25}NH_2$ *dodecylamine*
$C_{14}H_{29}NH_2$ *tetradecylamine*
$C_{16}H_{33}NH_2$ *hexadecylamine*

(*b*) *Long-chain quaternary ammonium compounds, including—*

Fig. 6

$C_{12}H_{25}N(CH_3)_3^+Cl^-$ *dodecyltrymethylammonium chloride*
$C_{16}H_{33}N(CH_3)_3^+Cl^-$ *hexadecyltrimethylammonium chloride*
$R_{coco}N(CH_3)_3^+Cl^-$ *coco-trimethylammonium chloride*

(R-coco residue is derived from coconut oil and has the approximate chain-length distribution — 47% C_{12}, 18% C_{14}, and less amounts of C_8, C_{10}, C_{16} and C_{18}.)

Fig. 7

$R_{coco}N(CH_3)(C_2H_5)^+(CH_3SO_4)^-$ *coco-dimethylethylammonium ethosulphate*
$R_{coco}N(CH_3)_2C_6H_5CH_2^+Cl^-$ *coco-benzyldimethylammonium chloride*

(*c*) *Other long-chain amine derivatives, including—*

Fig. 8

$R_{coco}N^+(CH_3)_2CH_2COO^-$ *carboxymethyldimethyl cocoamine (cocobetaine)*
$R_{coco}N(CH_2CH_2OH)_2$ *bis(hydroxyethyl cocoamine)*
$R_{coco}N(CH_3)_2O$ *dimethylcocoamine oxide*

The results afford useful guidance in preparing new dye retardants for use in the dyeing of "Orlon" and related fibres with cationic dyes.

Fig. 9 $\left[RN(CH_3)_3\right]Cl$

It would appear that almost any long-chain amino compound is likely

to have a retarding effect in the dyeing of "Orlon" with cationic dyes and that it is not strictly necessary from the viewpoint of securing maximum dye retarding power to use these in the form of their quaternary ammonium compounds. However, since the quaternary ammonium compounds are

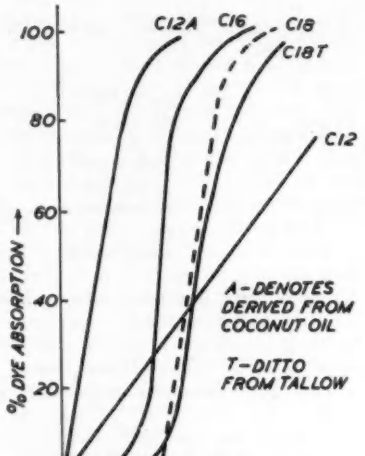


Fig. 10. Curves showing the effect on dye retarding of the length of the carbon chain Cn in compounds of the type: $[RN(CH_3)Cl$

often more soluble in water at higher pH values and because they can be more resistant to discolouration there is a natural bias in their favour.

From the comparison of a number of alkyltrimethylammonium salts differing in respect of the length of the carbon chain in their alkyl constituent and conforming to the general formula given in Fig. 9, it is concluded

Fig. 11 $\left[C_{12}H_{25}N(CH_3)_2\right]^{+-}X$

that the optimum carbon chain length is about C_{12} since such compounds produce a steady dyeing rate up to fairly high dye liquor exhaustions. On the other hand, those compounds having alkyl constituents of C_{16} and C_{18} much hinder the pick-up of dye during the initial stages of dyeing so that they can the more definitely hinder an uneven "strike" of the dye—a highly desirable property. The relative dye-retardant powers of several compounds of the above type are shown by the curves in Fig. 10—those curves for compounds of the C_{12} type clearly show that such compounds do not prevent a possibly too rapid "strike" of dye in the first stages of dyeing, that is, on entry of the "Orlon" goods into the dye liquor.

In considering the dye-retardant properties of those compounds conforming to the general formula shown in Fig. 11 and which are formed by quaternising with di-methyl sulphate or diethyl sulphate or simply methyl chloride it is seen that the quaternising substance is relatively ineffective and that the dye-retardant action is almost entirely due to the long-chain amine portion of the molecule. This is made evident by the dye absorption curves in Fig. 12 which lie very closely together irrespective of which of the above mentioned three quaternising substances are employed in the preparation of the dye-retardant.

Fig. 13 shows dye-absorption curves for a series of primary alkyl amine

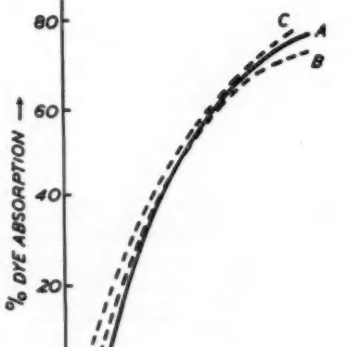


Fig. 12. Dye absorption curves showing the effect on dye retarding of the anion x in dye retarding agents of the type: $[C_{12}H_{25}N(CH_3)_2R]^{+-}_{\times}$

Curve	R	× Anion
A	CH_3	$C_2H_5SO_4$
B	C_2H_5	CH_3SO_4
C	CH_3	Cl

acetates and these indicate that with an increase of carbon chain length in the general formula in Fig. 14 to which these compounds conform there is a progressive increase in dye "strike" period in the initial stages of dyeing and also a progressive decrease in the rate of dye absorption.

These investigations of Cohen and Endler are very interesting not only because they indicate the lines on which it is perhaps most promising to procede in the search for improved dye retardants but also because they indicate the highly complex organic chemicals which are now being required for use in dyeing processes—

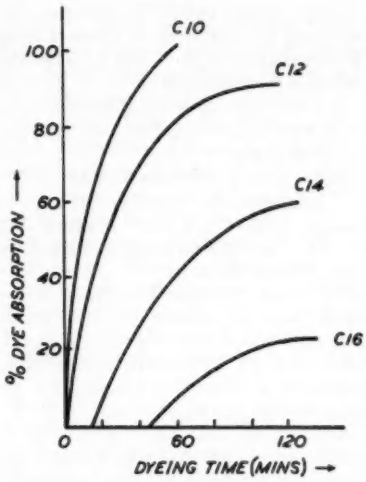


Fig. 13. Curves showing the effect on dye retarding of the carbon chain (Cn) in dye retarding agents of the type R. NH_2CH_2COOH

organic chemicals based on raw materials now being largely obtained from the petroleum industry rather than from coal tar (the source,

Fig. 14 $RNH_2.CH_2COOH$

scarcely thirty years ago, almost exclusively called upon to supply such raw materials).

Knowledge for Tomorrow

"Informed speculation" about the future of the textile industry will be the main object of a course organised by the Textile Institute. The course, the second such Post-Graduate Course, will be held at Leeds, July 8 - 18. Graduates from the various sections of the textile industry are offered an opportunity of keeping ahead of current developments. Entry to the course is limited to graduate technologists (A.T.I.) or holder of a degree or diploma in textiles or in other appropriate subjects, who have been in industry for a period of not more than ten years after qualifying. The course will be based at Leeds University and the Wool Industries' Research Association and seven leading producers and processors in the Yorkshire area are offering facilities for visits and discussions during the day. Each evening there will be lectures, etc., of a nature designed to give information about economic and commercial problems of the industry. Tutor-in-charge of the course will be Dr. P. P. Townend, B.Sc., F.T.I. (Leeds University).

* * *

Government Proposals for Cotton Industry

The Board of Trade have engaged Binder, Hamlyn and Co., chartered accountants, to assist them on matters concerning the Government proposals for the reorganisation and re-equipment of the cotton textile industry. Mr. A. G. B. Burney, a senior partner in the firm, has been assigned for this task.

Plant Maintenance in the Textile Industry

By J. V. PHILLIPS

PLANT maintenance in textile mills must be carried out at as low a cost as is possible, using the best materials available and with careful planning to ensure making full use of maintenance staffs. Recent statistics show in the United States that the cost of maintenance in U.S. textile mills amounts to around 2½% of the value of net sales, or from 8% to 12% of property value based on present replacement costs of buildings, machinery and equipment. In many of our mills this cost is undoubtedly higher.

If systematic maintenance is carried out, it has been estimated that savings in maintenance costs could be made which would amount to as much as ½ of 1% of the values of net sales. Proper planning of every maintenance task is essential because hourly rates for tradesmen and technicians can add up to an appreciable figure and this labour must be utilised to the best possible advantage. Setting up what can be termed "preventive maintenance" must result in a substantial cost reduction because such a programme does provide information on the necessity for repairs. A well-planned programme will thereby reduce expensive repairs and replacements to a minimum.

Breakdowns

When an emergency breakdown occurs on a vital production machine, whether in opening, carding, spinning or weaving departments, the first thought of the maintenance engineer is to use whatever material and labour is available without thought to the cost to get the machine in operation again. This, of course, is costly and can often be prevented if proper maintenance planning is carried out.

A preventive maintenance programme in any mill must be financially profitable. Naturally, this saving cannot always be calculated directly in terms of money but it will show up indirectly in the costs of running the maintenance and repair departments. There are, of course, other advantages to a preventive maintenance programme which will affect the profits realised in producing textile goods. These are the improvements obtained in the quality of the materials produced and a reduction in the time lost from machines which break down. Equipment not properly looked after soon has many worn parts which will get out of adjustment resulting in the production of poor quality work and the frequent breakdowns for repairs and replacements.

Formulating a Programme

Periodic inspections of machinery and equipment must be carried out if maximum efficiency is to be attained. Two kinds of inspection can be made, the first of which can be done while the machinery and equipment are in operation. Often this type of inspection will reveal the presence of loose or worn parts, bad adjustments, wrong lubrication, and abnormal production speeds. The second inspection should be carried out when the machinery is not in use, i.e. during lunch breaks, week-ends, holiday periods, etc., and at this time concealed parts of all machinery should be thoroughly checked for wear. Obviously a complete picture of the condition of a machine or piece of equipment can be obtained by combining both inspections.

Manufacturers of textile machinery will always be glad to co-operate with the plant engineer or maintenance foreman on the proper type of inspection to make on their equipment. Manufacturers of fibre preparation machinery, yarn making equipment, fabric producing and finishing machinery will be able to give worthwhile advice on the question of the correct settings and adjustments, adequate lubrication, and correct operating procedures, and all this valuable information can be included in the maintenance programme. These details can also be used by the works engineer to show the management that the machinery and equipment is being maintained in the best possible condition at minimum cost.

Charts

It is a good plan to keep a maintenance and repair chart alongside every machine. All information such as date and type of inspection carried out, name of inspector, results and action of the inspection, are thereby readily at hand. This also enables a supervisor to keep a close check on the number of inspections being made. A great deal more could be written about preventive maintenance programmes, but if they are not properly planned and executed, the advantages cannot be fully assessed. The programme should be presented in an intelligent way so that it can be fully understood by every operator and so that a minimum of production time is wasted.

Success of such programmes also depends largely on the skill and knowledge of the mechanics who make the inspections and running repairs. In addition to this preventive maintenance work on machinery and equipment, a similar programme should be carried out in the remainder of the factory to cover such things as roofs, walls, floors, painting, and general cleaning. Floors should always be kept clean and dust free. They should also be free from grease or holes for many accidents are caused by pitted or slippery concrete floors. Added to this, clean working conditions have an undoubted effect on the morale of the employees. Other installations such as dust extraction plants, boilers, air conditioning systems, etc., should all undergo regular inspections, and a report made to the works engineer.

It must be remembered that any such programmes must be run with a minimum of labour and money, as to make them involved and costly would defeat the original objects. Also, the state and newness of the plant and machinery will affect greatly the extent of such programmes for a modern factory with new machinery will not require such frequent inspections as an old textile mill equipped with machinery which has been in service for many years.

The important point to be remembered by the plant engineer and maintenance engineer is that preventive maintenance is worth while, and will in a very short time allow him to reduce his maintenance costs. If such a programme is carefully followed, the engineer will very soon be able to realise a financial profit for the company which will show up as a sizeable figure compared with net sales or gross property values.

New Books

FAERBERISCHE EIGENSCHAFTEN VON ZUR HERSTELLUNG VON VERDICKUNGEN IN DER STOFFDRUCKEREI BESTIMMTEN STOFFEN. (Dyeing properties of materials used as thickeners in textile printing.) By P. Vogel. Report No. 496. Westdeutscher Verlag Koeln and Opladen. 1958. pp. 26. (DM 9.30.)

The purpose of this work was to establish the dyestuff equilibrium in thickener systems between thickener and water. To this end, dyestuff was added to the thickener system and a quantity of viscose rayon dyed in it under various conditions of temperature and electrolyte. From the quantity of dyestuff absorbed by the rayon (as found by stripping with pyridine) the amount of dyestuff absorbed by the thickener could be calculated. Potato and wheat starch as well as Nafka crystal gum were investigated. Skyblue FF was used as dyestuff. Starch has definite affinity for the dyestuff, absorbing one-tenth to one-hundredth of the quantity absorbed by the rayon. Gum has no affinity for dyestuff. At 60°C. and 80°C. wheat starch absorbs more dye than potato starch. This conforms well to practical experience where wheat starch is known to give printing pastes of best dye transfer.

B.S.

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UNTERSUCHUNGEN IN DER LEINENGARNBLEICHE. (Investigations in linen yarn bleaching.) By W. Rohs and I. Geurten. Report No. 501. Westdeutscher Verlag Koeln and Opladen. 1958. pp. 37. (DM 11.50.)

This investigation concerns the effect of the sequence of treatments in linen bleaching on the degree of damage of yarns when the combined hypochlorite-peroxide-chlorite bleach is used. Four different flax yarns were treated by changing the sequence of operations. Degree of polymerisation and degree of whiteness were the determining factors. Whereas hypochlorite in the first bath caused a serious fall in the degree of polymerisation, peroxide and chlorite proved rather mild in action. Even further treatment with hypochlorite, after the last two treatments, produced a satisfactory result. The condition of the hypochlorite treated yarn however remained bad when further reacted with chlorite in the mildest possible manner. The degree of whiteness was good in all cases, even when the degree of polymerisation remained high. It is thus in the hands of the bleacher to produce good white linen yarn with maximum preservation of the fibrous material by a sensible sequence of bleaching operations.

B.S.

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VERGLEICHENDE UNTERSUCHUNGEN AM SCHOPPER-SCHEUERPRUEFGERAET. (Comparative tests on the Schopper abrasion tester.) By J. Juilfs. Report No. 500. Westdeutscher Verlag Koeln and Opladen. 1958. pp. 59. (DM 18.10.)

In order to determine the accuracy and reproducibility of abrasion figures for the Schopper abrasion tester, comparative tests were carried out in nine different laboratories. It was found that abrasion expressed by the number of rubs leading to formation of holes is not reliable. Accuracy within 15% is achieved by expressing abrasion in the form of relation of number of rubs to the change in some fabric properties, such as thickness, bursting strength, etc. Many diagrams illustrate these factors.

B.S.

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DIE AUSNUTZUNG DER GARNFESTIGKEIT IN HALBLEINENGEWEBEN. (The utilisation of yarn strength in half linen fabrics.) By W. Rohs. Report No. 674. Westdeutscher Verlag Koeln and Opladen. 1958. pp. 45. (DM 12.50.)

An effort was made in this research study to determine the utilisation of yarn strength in half-linen fabrics as a function of various yarn and fabric factors. Starting with a relatively coarse half-linen fabric variations were made in density of warp and weft, in the warp with single and folded yarns and in the weft with yarns of varying number and degree of bleaching. The strength of the fabrics was determined dry and wet in both directions and was related to the yarn strength by the following formula:—

$$\text{Utilisation (\%)} = \frac{\text{Fabric strength (kg.)} \times 1{,}000}{\text{Threads/5 cm.} \times \text{yarn strength (g)}} \times 100$$

The results are not entirely conclusive but it became apparent that the warp yarn strength is better utilised in twill weaves than in plain weaves. The opposite is the case with weft yarn strength.

B.S.

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HERSTELLUNG SAUREFESTER TECHNISCHER GEWEBE. (Preparation of acid resistant technical fabrics.) By Prof. H. Zahn and Dr. W. Gerstner. Report No. 498. Westdeutscher Verlag Koeln and Opladen. 1957. pp. 28. (DM 9.65.)

Although wool is naturally considerably resistant to acids, it still can loose strength and substance when treated with acids in certain ways. This report deals with modifications of wool designed to increase the resistance to acids. Nineteen different treatments were carried out. As it was found that aqueous weak alkaline organic solutions decreased the tear strength of wool, substances insoluble in water were employed in the form of aqueous emulsions. The effects were tested by a new technique consisting of boiling the modified and original sample for three hours under reflux with n/10 sulphuric acid and checking the wet tear strength after thorough rinsing. A considerable improvement in acid resistance is obtained by treatment with bis-chloro methyl dimethylbenzene, terephthaloyl chloride, and quinone. Best results were achieved by dinitrophenylisation and by simultaneous methylation and acetylation.

B.S.

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DIE TEXTILFORSCHUNGSANSTALT KREFELD 1920-1958. (The Textile Research Institute Krefeld 1920-1958.) Report No. 614. By Prof. Weltzien, Dr. Juilfs and Dr. Bubser. Westdeutscher Verlag Koeln and Opladen. 1958. pp. 78. (DM 30.95.)

On the occasion of the inauguration of the new buildings housing the above Institute this report records the history of textile research not only in Germany but also in other countries. In this account the position of textile research in England is misinterpreted in so far as the various research establishments in this country are stated to be attached to the "Textile Institute." The developments of textile research establishments in other countries make interesting reading. There is a detailed description of the new research laboratories which are housed in a three-storey building which, including ground floor and basement, provide space on five floors. The arrangement of the laboratories are explained. Finally, the past and present work of the Textile Research Institute, Krefeld, is reviewed with long lists of publications of its members. Eleven photographs illustrate some of the features of the old and new buildings in which the Institute was and is now housed.

B.S.

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B.S. 3104 "NYLON MOUNTAINEERING ROPES." British Standards Institution, British Standards House, 2 Park Street, London, W.1 (price 3s.).

The committee of experts which produced this new standard for nylon mountaineering ropes included representatives from the Association of Scottish Climbing Clubs, the British Mountaineering Council, the Mountaineering Association, and manufacturing interests. In a foreword to the publication the experts point out that the four sizes of rope specified are characterised by the highest qualities known at present. This emphasis on quality was dictated by the fact that, in actual climbing, the conditions imposed on ropes are so diverse and dependent on chance that their simulation by means of actual tests is extremely difficult—if not impracticable.

Sizes and Weights of Ropes

Rope No.	Nominal weight		Nominal circumference	
	lb./100 ft.	kg./30 m.	in.	mm
1	1·25	0·57	$\frac{5}{8}$	16
2	2·5	1·14	$\frac{7}{8}$	22
3	4·25	1·9	$1\frac{1}{4}$	32
4	5·5	2·5	$1\frac{3}{8}$	35

The standard recommends only size 4 for rock climbing.

* * *

DRAFTING ROLLERS IN WOOLLEN AND WORSTED YARN MANUFACTURE. British Standards Institution, 2 Park Street, London, W.1 (price 3s.).

This new publication (B.S. 3091 : 1959) specifies a range of standard diameters of fluted top and bottom rollers and uncovered top rollers for the production of yarns on the woollen and worsted systems which cater for all normal requirements in the trade. Methods of test for eccentricity of the drafting rollers are laid down (this problem necessitated considerable investigation so that limits could be fixed in such a way as to safeguard the quality of the yarn).

* * *

QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF NYLON 6 OR NYLON 6·6 AND CERTAIN OTHER FIBRES. British Standards Institution, 2 Park Street, London, W.1 (price 3s.).

This method (applicable to mixtures with up to 25% of wool) is based on Textile Institute Tentative Textile Standard No. 48. It provides a procedure for estimating, after the removal of added matter, the proportions of nylon 6 or nylon 6·6 with cotton, viscose rayon or polyester fibres. The method of analysis and the calculation of results are described in detail.

QUANTITATIVE CHEMICAL ANALYSIS OF MIXTURES OF VISCOSE RAYON AND COTTON. British Standards Institution, 2 Park Street, London, W.1 (price 3s.).

This method, based on Textile Institute Tentative Textiles Standard No. 49, provides a procedure for estimating, after the removal of added matter, the proportions of viscose rayon and scoured, unscoured, kiered or bleached cotton in mixtures of these fibres. The method of analysis and the calculation of results are described in detail.

* * *

YARN COUNT SYSTEMS AND CONVERSIONS. British Standards Institution, 2 Park Street, London, W.1 (price 3s.).

Recent international agreement on a standard method of indicating yarn count or number is reflected in this new edition of B.S. 947. The standard defines the basic unit, which is designated "Tex" and derived from the mass per unit length of the yarn. A recommended multiple and sub-multiple are specified with conversion factors for translation to and from the "Tex" and traditional systems. The international agreement on "Tex," formally registered in 1956, has already been implemented to a notable extent by both technical and commercial interests in this country.

* * *

G.W.B. CONTROL GEAR. A profusely illustrated catalogue from G.W.B. Furnaces Ltd. (Control Gear Div.), P.O. Box 4, Dibdale Works, Dudley, Worcs., traces the growth of the Control Gear Division from its humble beginnings five years ago in a corner of Dibdale Works, to the new plant at Bangor, N. Ireland.

* * *

ELECTRO-MECHANICAL BRAKES. An illustrated brochure featuring L.D.C. electro-mechanical brakes is available from Lancashire Dynamo and Crypto Ltd., St. Stephen's House, Victoria Embankment, Westminster, London, S.W.1. A Size 6 L.D.C. brake is shown in various stages of assembly on a 5 h.p. electric motor, together with six different applications for L.D.C. brakes. One of these illustrates a 2 h.p. "Fankuld" motor with 6-in. brake, fitted to a carpet loom.

* * *

DUST IS A FIRE HAZARD, A new bulletin (1s. 6d.) introduced by the Fire Protection Association, Garrard House, 31 - 45 Gresham Street, London, E.C.2. An enlargement on the old bulletin which dealt only with a single fire hazard, the new version covers subjects, ranging from the main article "Dust is a Fire Hazard" to "No Fire Without Smoke"—a review of the two main types of automatic fire alarm systems.

* * *

HEADS AND THREADS. The 1959 edition of "Heads and Threads Buyers Guide" is available from Heathcote and Coleman, 69 Harborne Road, Edgbaston, Birmingham 15. Valuable information includes members' list with address and telephone number and British Standard Specifications for bolts, cotterpins, screws, nuts, studs and washers.

* * *

OVERSEAS ADVERTISING. Publishing and Distributing Co. Ltd., 177 Regent Street, London, W.1 (price 6s.). In the foreword the editor points out that in Scandinavia, competition from Britain's trade rivals is becoming keener, particularly Germany and the U.S.S.R. If British exporters are to maintain their position, they must keep their wares continually before the prospective purchasers. The articles included are therefore designed to acquaint the exporter with each of the five countries concerned.

Technical Literature

PROPERTIES AND CHARACTERISTICS OF ALUMINIUM CASTING ALLOYS. Association of Light Alloy Refiners and Smelters Ltd., 3 Albemarle Street, London, W.1. This is the first publication to be issued by this association and as the title indicates it contains data for all the aluminium casting alloys to British Standard 1490. In addition to specification requirements it gives properties and information on the physical, foundry and other characteristics of the alloys as well as a section on heat-treatment and a guide to selection of alloys. Based on the original ALAR data sheets it contains considerably more information.

* * *

FIRE HAZARDS ASSOCIATED WITH THE THERMAL INSULATION OF BUILDINGS. The Fire Protection Association, 31-45 Gresham Street, London, E.C.2, has issued a reprint of Technical Information Sheet No. 4002, which describes the implications of numerous tests carried out in this field by the Joint Fire Research Organisation. Special attention is paid to the restrictions placed by the Thermal Insulation (Industrial Buildings) Act, 1957 on the use of certain insulating materials which enhance the outbreak and spread of fire. Copies of the information sheet can be obtained on application.

* * *

SURFACE ACTIVE AGENTS. An extremely well-produced booklet of 28 pages issued by Union Carbide Ltd., 103 Mount Street, London, W.1, gives some compact and valuable information on "Nonex" non-ionic agents. These have a wide range of physical properties which make them eminently suitable for use in wetting, dispersing and emulsifying applications and as plasticisers. Textile applications include these agents in spinning and knitting oils, in warp sizing, anti-static preparations, scouring and rinsing, surface coatings, hand cleaning, etc., wetting and spreading.

* * *

FILMS FOR INDUSTRY. Published by the Central Film Library, Government Building, Bromyard Avenue, Acton, London, W.3 (price 2s. 6d.). The 1959-60 edition of this useful catalogue of industrial films, contains details of over 1,250 documentary and short films on the widest variety of subjects. In the "Textiles and Clothing" Section five 16 mm. "shorts" are available for hire, three of them free of charge. They are: "Gacots," "The Wovax Story," "V.S.A. Multiple Card Stripping System," "Textiles Unlimited" and "Crest of Quality."

* * *

THE WORLD OF WOOL. The annual review for 1957-58 of the International Wool Secretariat and Wool Bureau Inc. celebrates the coming of age of the organisation. For this reason, surveys have been included showing the remarkable progress made by the Secretariat as a pioneer of wool publicity and the important part it has played in wool research, together with a section on pastoral developments. Maintaining the usual high standard, and lavishly illustrated, the review provides a wealth of useful "wool" information.

* * *

NORALDUCT. A folder describing "Noralduct"—a solid aluminium sheet with internal ducts and passages—has been released by Northern Aluminium Co. Ltd., Banbury. "Noralduct" is claimed to be particularly suitable for heat transfer equipment with either a plain or pattern finish, and almost any complex continuous pattern that can be drawn on paper can be formed into integral passages within the sheet.

* * *

GLYCERINE DATA SHEET. United Kingdom Glycerine Producers Association Ltd., 5 Bridewell Place, London, E.C.4. Printed on heavy board, a new data sheet gives a summary of the physical properties of glycerine including tables showing specific gravity, freezing points and vapour pressure/relative humidity data for different concentrations of glycerine in water. The sheet also describes the three principal grades of refined glycerine: (*a*) chemically pure, which conforms to both B.S. 2625 and the current British pharmacopoeia; (*b*) technical grade, which conforms to B.S. 2623 and suitable for adhesives, dyestuffs, etc., and (*c*) dynamite grade, which conforms to B.S. 2624. Research chemists will find this a helpful ready-reference.

* * *

TELLING COMMERCIAL OFFICERS ABOUT MAN-MADE FIBRES. British Man-made Fibres Federation, Bridgewater House, 58 Whitworth Street, Manchester 1. This brochure describing the main products and activities of the British man-made fibres industry is being distributed through the B.o.T. to some 200 overseas commercial officers in order to help them in answering the numerous queries that arise about British man-made fibre staples, yarns and piecegoods. The new brochure is simply but attractively produced in the form of a folder containing Part 1—The Fibres; Part 2—The Industry and Production; Part 3—Appendices.

* * *

FACTS ABOUT MAN-MADE FIBRES. British Man-made Fibres Federation, Bridgewater House, 58 Whitworth Street, Manchester 1. This useful booklet is intended to provide accurate non-technical information about the properties, advantages and care of all the man-made fibres now produced in Great Britain. It will prove to be an excellent reference work for all concerned with the production and sale of fabrics and garments.

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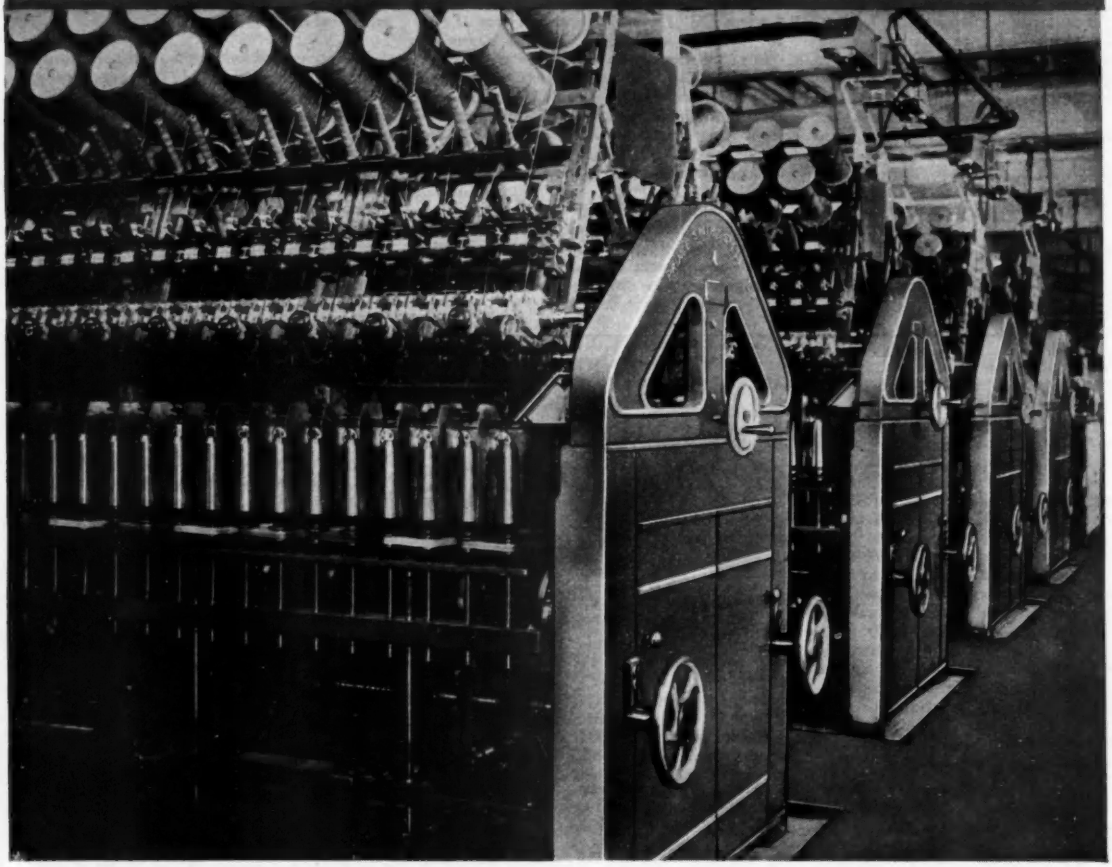

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The Economic Advantages of AMBLER SUPERDRAFT are :-

- Very high draft with consequent reduction in drawing machinery, labour and waste.
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PSS 4

Export Opportunities

Rhodesia and Nyasaland:
Dress Fabrics

Mr. G. H. Elder, P.O. Box 2095, Bulawayo, Southern Rhodesia, is keen to acquire an agency for cotton dress fabrics up to 5s. a yard f.o.b. He covers the whole of the federation and represents several well-known U.K. manufacturers. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, R.T.A. House, Baker Avenue, P.O. Box 984, Salisbury.

U.S.A.:
Cap Materials

Louisville Cap Co., 310 South 30th Street, Louisville 12, would appreciate quotations from U.K. suppliers of the following materials used in vast quantities in the cap industry:—

Nylon Mesh.—Knitted or woven material; colour is of no importance. Quote per yard running.

Suede.—Sprayed or brushed dyed material would be acceptable.

Cape Leather.—Same applies as for suede.

The firm have operated accounts with a number of U.K. concerns in the past few years, and quotations in dollars for delivery to New York Port and samples should be sent to Mr. S. Rosenberg at Louisville Cap Co., P.O. Box 1436, Louisville 1, Kentucky. Firms should also copy their correspondence to the British Consulate-General, Commercial Section, 1828 The Illuminating Building, Cleveland 13, Ohio.

Canada:
Woollen and Cotton Piece Goods

Mr. G. Precious, manufacturers' representative, 141 Water Street, Vancouver 3, B.C., is interested in representing U.K. manufacturers of the following:—

(1) Woollen piece goods, suitable for sale to the men's, women's and children's clothing industry.
(2) Cotton drill, commercial grades.
(3) Cotton gaberdine, "Velan treated," suitable for the manufacture of sportswear.

He has been established in British Columbia for ten years. The agencies he holds are predominantly U.K., including some well-known manufacturers of textiles and outerwear. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, The Mercantile Bank Building, 540 Burrard Street, Vancouver 1, B.C.

Pakistan:
Yarns, etc.

I. A. Imtiaze, Esq., C.S.P., Joint Registrar Co-operatives, The Mall, Lahore, West Pakistan, urgently requires quotations for embroidery threads skeins, balls, reel; pigment and dry colours; wool yarn 60's and 64/2; and printing dyes. Suppliers interested should write direct, also to notify the U.K. Trade Commissioner, National House, Bank Square, The Mall, P.O. Box No. 287, Lahore.

Norway:
Barathea Piece Goods

Bestyrer O. Skar of Generalintendantens Uniformsutsalg, Kontraskjaeret, Oslo, would like quotations from U.K. manufacturers of barathea piece goods. A total of 5,000 metres is required with a width of 150 cm. The material is required for army and air force uniforms; 3,000 metres olive green (O.D.7) for the Army and 2,000 metres Air Force blue for the Air Force. Two qualities are of interest, all wool and "Terylene"/wool mixture—55% "Terylene" and 45% wool. Manufacturers interested should write direct, also notify the British Embassy, Commercial Department, Drammensveien 4, Oslo, Norway.

Greece:
Blankets, Sheets, etc.

Bourlos Brothers, 11 Jan Smuts Street, Athens, would like to receive offers from U.K. manufacturers of blankets of all qualities (both all wool and mixtures) and cotton sheets and pillow cases. Formed in 1951, their business is the import of textile piece goods for their own account. Manufacturers interested should write direct, also should notify the Commercial Department, British Embassy, 10 Odos Loukianou, Athens.

Western Germany:
Cotton Yarns

Bielefelder A.G. fuer Mechanische Weberei, Bielefeld, Teutoburger Strasse 98, want to contact U.K. suppliers of cotton yarns in 12, 14, 16, 20 and 30 English counts. Established in 1862 they operate a weaving mill where bed and table linen, interlinings, wadding, upholstery and furnishing fabrics are manufactured. Suppliers interested should write direct, also notify the British Consulate-General, Duesseldorf, Cecilienallee 16.

Transvaal;
Worsted Piece Goods

William Jackson (Pty.) Ltd., 504 Pritchard House, Pritchard Street, Johannesburg, are anxious to obtain U.K. agencies for fancy worsted piece goods. Established in 1926, they represent eight U.K. concerns for canvas, sail cloths, handkerchiefs, shirtings and flannelettes. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Johannesburg.

U.S.A.:
Manufacturing Textiles Under Licence

American Associated Companies Inc., 451 Stephens Street, S.W. Atlanta, Georgia, would like to get into touch with U.K. manufacturers of textiles interested in having their products manufactured under licence in the U.S.A. Formed in 1932, they are engaged in wholesaling and manufacturing textile products; and manufacturers interested should write direct, copying their letters to the British Consulate, Commercial Section, 422 Hurt Building, Atlanta 3, Georgia.

Canada:
Hose Piping

Northern Canada Supply Ltd., 275 Bloor Street West, Oshawa, Ontario, are interested in hearing from U.K. manufacturers of hydraulic hose, nylon hose, polyethylene hose and p.v.c. hose. Established in 1909, the firm operate throughout Ontario and northwestern Quebec, and run their own fleet of trucks from their stocking warehouses to maintain delivery schedules to customers. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, 119 Adelaide Street West, Toronto.

U.S.A.
Wool Carpet Yarn

Acme Lumber and Supply Co., Inc., 421 N. Thornton Avenue, Dalton, Georgia, are seeking a U.K. source of supply of wool yarn for carpets, mainly for sale to the tufted carpet manufacturers. The firm feel they can sell a considerable volume of wool yarn if a proper connection is made. Manufacturers interested should write direct with f.o.b. and c.i.f. prices in U.S. currency, also copy correspondence to the British Consulate, Commercial Section, 422 Hurt Building, Atlanta, 3 Georgia.

Somaliland:
Drill for Uniforms

The Commandant of the Somalia Police Force, wants to contact a U.K. firm willing to supply materials for an officer's shop which the Somalia Police propose to open. Such materials should include white and khaki drill for uniforms, stockings, shoes, etc. The volume of business is unlikely to be great in the first instance, but the commandant hopes to extend his shop gradually to cater for the needs of other ranks. Suppliers interested should write direct to the Commandant, Somalia Police Force, Mogadishu, also notify the British Consulate General, 7/8 Via Locatelli, P.O. Box 15, Mogadishu.

Fiji:
Piece Goods, etc.

The Hazrat Trading Co. of G.P.O. Box 145, Suva, want to contact—

(1) An export house which can supply piece-goods, rayon and "Terylene" suitings, men's and women's garments.
(2) A manufacturer of silk and rayon fabrics, silk and "Terylene" and other similar mixtures.

Hazrat Trading Co. are an Indian firm of commission agents closely associated with Narseys Ltd., Suva, an old established firm of general merchants. Suppliers interested should write direct also notify the Commerce and Industries Office, The Secretariat, Suva.

Libya:
Carpets and Rugs

Mr. Sanin Vaturi, 139 Sciara Istiklal, Tripoli, Libya, would like quotations from U.K. firms for carpets and rugs. He is an importing agent and manufacturers interested should write direct, also notify the British Embassy in Libya, Commercial Department, 30 Lungomare Badoglio, Tripoli.

Libya:
Haberdashery Materials, etc.

Mr. G. Vaturi, 226 Sciara Istiklal, Tripoli, has told the British Embassy in Libya, he would like to receive prices on haberdashery materials and supplies. He is one of the largest importers and retailers of textiles in Tripoli, and manufacturers interested should write direct, also notify the British Embassy in Libya, Commercial Secretariat, 30 Lungomare Badoglio, Tripoli.

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AXMINSTER
LOOMS

18" TO 4 YDS.
50 CM. TO 350 CM.

★ *High efficiency with proved firm gripper weave.* ✱ *Variable Quality of 4-10 rows per inch.* ✱ *Patent rotary beam for simplified warp Beam replacement.* ★ *Push button all electric control.*

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MECHANICAL WORLD YEAR BOOK
for 1959

The prime aim of structural development in recent years has been reduction in weight. The technique of cold forming permits an increase in the load carried per pound weight of structure. This can be achieved on the one hand by using thinner material and on the other by providing a very much greater variety of shapes. The latter feature allows the structural engineer not only to select but if necessary to design the section shapes most suited to his purpose. Cold-formed design in its conception differs from the design of hot-rolled members only in taking account of features which, due to the relatively "thicker" section outlines used in hot-rolled construction, are disregarded in that field. Thus cold-formed design does not really involve a study of new features but rather a reconsideration of neglected ones. A new article in this edition of the Year Book presents full data for practical design in the new medium.

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Boiler Mountings, Fitting, and Instruments
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Toothed Gearing
Production of Gears

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Tolerances and Fits
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Decimal Equivalents of £1
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Classified Buyers' Directory
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General Index

Copies may be ordered through any bookseller or direct from the Publishers,
EMMOTT & CO. LTD., 31 King Street West, Manchester 3; and 158 Temple Chambers, Temple Avenue, London, E.C.4

Textile Trade and Prospects

Cotton Yarn and Cloth

Cotton yarn and cloth demand has been slightly better on the whole but activity is still woefully behind present potential capacity. The Budget did not provide much of a fillip to the trade and this, coupled to the noticeable lack of confidence in cotton prices, has adversely affected trading conditions. The Government's plan for the industry is also another factor operating against settled normal negotiations. A little more optimism is rather overshadowed by the realisation that whatever re-organisation is contemplated it can only result in a smaller but more compactly efficient industry; an industry still vitally important to the country's economic strength. Turnover in yarns has been more encouraging in some mills—an indication that available business is now shared by a less number of spinning units. Whilst it is not, in itself, indicative of healthier conditions, the better tone does help to dispel the pessimistic atmosphere. Business in yarns has covered almost every count and quality but total turnover still remains disappointingly low. Standard weaving counts on ring beams, cone, cheese, and cop have probably accounted for most of the business. Coarse numbers have been moderately well supported and greater weights of condenser types have been recorded. Bolton type mule wefts and doubling wefts are still in poor request but hosiery qualities in hank and cone have sold better. Blended yarns of cotton/rayon, cotton/nylon, and other specialities find ready buyers but the weights booked still remain low. In some folded yarns the small, but firm inquiry from Europe has been definitely better.

Cloth sales follow the same rather dismal pattern. Bids are often ridiculously low and whilst in most cases these are ignored isolated examples have been known of weak selling in which the margins could not cover costs. Much of the sales have been on replacement account with bookings showing the quantities perhaps more restricted than ever before and accent on early delivery. A wide range of apparel cloths have been dealt with in cotton and spun rayon and in mixture yarns. Sales have been spread fairly evenly over dobby and jacquard coloured woven cloths, and screen and roller printed designs in bright contrasts and multi-coloured pastel shades. Objective market analysis and imaginative designing are certainly powerful factors in this ceaseless search for additional business. The market for furnishing fabrics is undoubtedly brighter—in keeping with arrival of summer-time. More business has been booked than for the past few months but, again, individual orders are only for short runs. Large orders are now almost a thing of the past and this state of affairs may go on for a long time yet. Household textiles are moving in a more satisfactory manner. Towels, bath mats, and other terry specialities have sold in greater quantity these last few weeks. Industrial textiles are still quiet but one or two lines have helped to liven a otherwise depressed atmosphere. Overseas business still remains scrappy. European activity is a little better and one or two Dominion outlets have taken a few special lines.

Wool Prices and U.K. Consumption

In one of the most pronounced upward movements for two years, Commonwealth wool prices have advanced by amounts ranging from 15 to 20% and in some instances rather more than that—in the sales which have taken place since Easter. During the first week of resumed sales in Australia, greasy merino combing wools rose in price by 10d. to 1s. per lb. (clean weight), and the market continued to be decisively against the buyer in all qualities. Commonwealth sales for South African wool prices have moved in line with those of Australia—closed with prices at the highest point of the season and they recovered a considerable part of the ground conceded during recent months of difficult trading conditions.

At the recent London wool sales, Australian and South African greasy merinos were quoted fully 20% dearer than at the previous London sales, the spot market thus fully reflecting the more gradual advance which has taken place in primary markets during the interval. New Zealand greasy crossbreds, which recorded an initial advance of 15% in London, were another 2½ to 5% dearer at the second sale. Although specific reasons for the advance are difficult to assign, it is commercially considered that the approaching end of the Commonwealth wool marketing season has brought a general realisation that many countries are by no means heavily stocked for meeting probable requirements during the coming period when auctions will be at a temporary standstill. A general widening of buying interest is reported from all centres, with Far Eastern buyers competing as strongly as European countries for available supplies. Both the New Zealand and South African Wool Commissions are re-offering at auction some of the wools they have previously bought-in under price support operations, and the gradual disposal at auction of the U.K. government stockpile of imported wool, which was discontinued some months ago, will be resumed at the London auction on May 27.

U.K. wool consumption is back to the level of two years ago—according to the Wool Industry Bureau of Statistics. These show that in February 1959, wool consumption in the country was 42·39 million lbs. (clean weight), compared with 37·53 million lbs. in February 1958, and 42·44 million lbs. in February 1957. As each of these three months had 20 working days, a straight comparison shows that, for all practical purposes, wool consumption has recovered to the level ruling two years ago. Top production during February, states the Bureau, was almost 3% higher than in January and 17% higher than in February last year, merino top output being 14% and crossbred top output 16% higher than a year ago.

The worsted yarn delivery rate was 5% higher than in January and 6% better than a year earlier. The rate of delivery in woven fabrics, however, was slightly lower than in January and about 8% below a year ago. Output figures for February were: top production, 28·66 million lbs.; tops drawn, 17·70 million lbs.; worsted yarns delivered, 18·26 million lbs.; woven wool fabrics delivered, 28·34 million sq. yds.; blankets delivered, 2·48 million sq. yds.

Linen Trade Review

The expansion in demand normally evidenced in the early spring months materialised at a later stage, and on a smaller scale than was hoped for. This is typical of the trend of contraction in recent years, being evidenced particularly in peak buying periods. The orders booked have provided much needed cover for spindles and looms still in production. Renewed interest in fine fabrics—welcomed by cambric and sheer manufacturers—resulted, in part, from the stimulus given to the handkerchief trade by the marketing of a standard fixed price product. The success achieved warrants extension of the scheme to other lines, particularly household specialities.

The advantages of linen for certain personal and household uses have not been equalled by competitors, so that consumer preference for substitutes is determined by price rather than by performance. In the home market, which absorbs approximately 50% of its output the chief competitors are cotton and man-made fibre products whose price advantage results from lower conversion costs. In main overseas markets it has to meet competition also from Continental linen manufacturers whose price advantage results from lower labour costs.

Bridging the price gap is no easy problem. Re-equipment alone does not provide the answer as evidenced by the number of re-equipped mills which have ceased production in recent years. Raw material accounts for 25 to 30% of the all in cost of the finished product. The termination of home flax growing has made British manufacturers dependent on Continental sources for their raw material requirements, and with the high freight cost of these they operate at a disadvantage compared with Continental competitors whose mills are located convenient to their raw material markets.

Competition is keenest in the range of ordinary household and personal linens on which profit margins are narrow. In the range of quality products, and particularly in the production of yarns for these, British flax spinners have few equals so that there is a considerable export market for yarns in this category. While demand for quality linens is limited it is strictly defined by price and could be

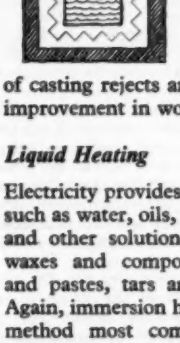
Resistance Heating – 2

Electric resistance heating elements have been briefly described in Data Sheet No. 4, with two examples of their application in industry. This sheet lists some of the further applications which can be effectively dealt with by resistance heating.

Soft Metal Melting

Electric resistance melting is most commonly used for lead, tin, zinc, antimony, aluminium and their alloys—in processes such as tinning, type-casting, die-casting and lining bearings—at temperatures of up to around 800°C.

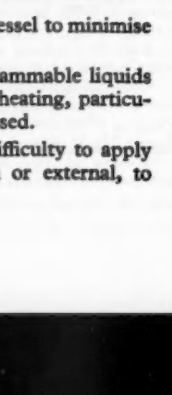
In most cases, sheathed elements are immersed directly in the metal, a more efficient method than applying heat to the outside of the containing vessel or pot. Immersion heating simplifies the application of lagging to the outside of the vessel, reducing heat losses and current consumption to a minimum. The elements are usually positioned near the inside wall of the vessel, leaving plenty of working space, but in a few cases, where the full volume of the pot is required, or where the metal to be melted is particularly corrosive, the elements are positioned outside the pot, often in contact with it.



In all cases, the precise temperature control that is so essential in soft metal processes is readily achieved by the use of electricity, and electric heating also leads to a reduction of casting rejects and metal wastage and a marked improvement in working conditions.

Liquid Heating

Electricity provides the ideal way of heating liquids such as water, oils, varnishes, plating, photographic and other solutions, and of melting and heating waxes and compounds, glues and pastes, tars and bitumen. Again, immersion heating is the method most commonly employed, but considerations of space or the nature of the liquid may sometimes necessitate the use of external heaters. Several types of devices are available to give precise and automatic temperature control, and lagging is again commonly applied to the vessel to minimise heat losses.

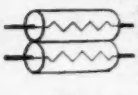


Fire hazards associated with inflammable liquids are invariably reduced by electric heating, particularly if immersion heaters can be used.

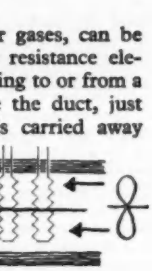
It is usually possible without difficulty to apply electric heaters, either immersion or external, to existing vessels.

Platen, Press and Roll Heating

Electricity offers the simplest and most convenient method of heating platens, dies and rolls. It gives the precise temperature-control characteristic of electric heating systems, with lower maintenance costs. Moreover, the relatively high temperatures required in some processes for maximum working speeds are reached without difficulty. Flexible electrical connections to moving parts give far less trouble than flexible pipe connections carrying hot water or steam.

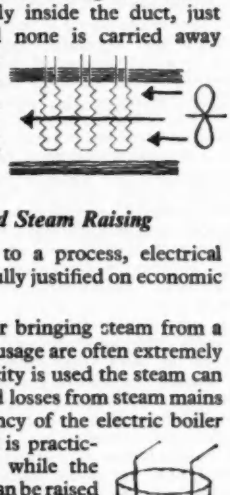


When electric heating is used, one or more presses can be operated without the necessity of keeping a boilerhouse staff at work.



Air Heating

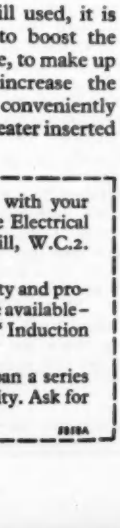
Streams of air, and of many other gases, can be heated most efficiently by electric resistance elements disposed across the duct leading to or from a fan. Heat is generated only inside the duct, just where it is required, and none is carried away through exhaust flues or pipes. Quick rise of temperature and precise temperature control are assured when electric resistance air heaters are used.



Electric Steam Boilers and Steam Raising

When steam is essential to a process, electrical steam raising can often be fully justified on economic grounds.

The means employed for bringing steam from a boilerhouse to the point of usage are often extremely wasteful, but where electricity is used the steam can be generated on the spot and losses from steam mains are eliminated. The efficiency of the electric boiler normally exceeds 96% and is practically constant at all loads, while the rapidity with which steam can be raised very largely eliminates banking losses.



Plant requiring process steam can be equipped with its own electric steam boiler, freeing the working space of steam mains just as individual electric motor drives free the factory of masses of shafting and belt drives.

Even where boilerhouse steam is still used, it is sometimes desirable for best results to boost the steam temperatures at the point of usage, to make up for transmission heat losses or to increase the superheat, and this function can most conveniently be performed by an electric resistance heater inserted in the steam line.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available – "Resistance Heating" is an example; "Induction and Dielectric Heating" is another.

E.D.A. also have available on free loan a series of films on the industrial use of electricity. Ask for a catalogue.

EDEA

considerably expanded by a reduction in price levels to make these goods more widely available. Most spinners agree that present margins would allow it but few are prepared to encourage expansion in this manner.

In present circumstances production of high class yarns would be defined by availability of the necessary raw material. Closer liason between producer and spinner would be required to ensure adequate supplies of suitable grades. Production of high quality fibre has progressively declined in recent years due to the increasing amount of white flower flax grown. This produces a heavier yield of low grade fibre and at ruling prices has proved a more economic proposition than the blue flower strains, despite their higher quality value. Expanding exports of Soviet flax have become strongly competitive with low and medium grades from west European sources and this is likely to divert interest of producers in France, Belgium and Holland to the higher qualities in which Russian fibre has not yet become competitive.

Recent efforts to enlist Government assistance in order to revive home flax growing have met with little success. In the N. Ireland House of Commons the Minister of Agriculture stated in reply to a question that it would be uneconomic to continue subsidies. The current world price was now about 17s. 6d. per stone, and the price necessary to make home production an economic proposition would be 35s. 0d. per stone. Although the N. Ireland Government had spent £1 million in flax subsidies in the last ten years they had failed to arrest the downward trend of production.

Jute, Fibre, Yarns and Cloths

Raw jute markets are quieter in Pakistan despite the fact that arrivals of loose jute from up-country are still small. A dearth of better qualities during the present season may mean consumers will only purchase requirements until the next season's growth is ready. U.K. purchases are at least equal to the annual consumption and there appears little likelihood of much more buying taking place unless shippers make offers of the higher grades of white and dark jute. Reports regarding the next crop are obscure but the area to be cultivated during the coming season should be sufficient to meet all requirements. Quality will depend largely on the type of weather during the growing and harvesting periods. The position appears satisfactory with nothing to indicate that much change can be expected in raw jute values in the near future. Offers of medium and lower grades are freely made but not the better qualities. This has been a disturbing feature during most of the present season and at no time has good class material been available in bulk. Some shippers have been remaining out of the market for some time except for more common qualities.

Spinners in Dundee are difficult to interest and business is small. A considerable amount of raw material is available ex-warehouse Dundee and spinners are picking up the occasional parcel to meet their needs but generally they show little interest in the forward position. Offers of Mill Firsts are being made at £114 10s., Mill Lightnings at £91 10s., Mill Hearts at £78 and grade Hearts at £64, c.i.f., U.K., for April/May shipment, but many shippers are asking more than the above rates especially for the higher qualities. Grade Tossa-2/3 is at £116 and grade Tossa-4 at £94 10s., with Continental Tossa-2/3 at £85. Crack Daisee-2/3 is available at £93 10s. and grade Daisee-2/3 at £87. A few offers of new crop fibre were made on the basis of £92 for Mill Lightnings and £80 for Mill Hearts but possibly less would have been accepted. It may be some time before offers of new crop jute are made in bulk.

The sales of Indian jute made some months ago for export are now to be shipped and it is expected that this will take place during the present month. The delay in implementing the contracts was caused by trouble over export duties, but the Indian government has decided that the duty of RS. 15 per bale is still in force. It is understood that balers will pay the export duty on sales already made and any loss incurred will be borne by the State Trading Corporation. Total sales of Indian jute for export were small and amounted to about 23,000 bales. The fact that India entered the export market for raw jute is not expected to have any influence on the position as the quantities available are small and the quality is not always suitable for spinners' needs. The production of jute in India is now equal to that country's consumption but a small importation is still necessary from Pakistan to supplement the better qualities. It is India's aim to become independent for raw jute supplies and further intensive cultivation will take place during the coming season to increase the output of better quality raw jute.

The Calcutta goods markets have been quiet during the past month.

Most consuming countries have been operating and securing their needs but there has been nothing of an outstanding nature taking place. So far as the U.K. is concerned normal purchases have been made and business has continued along expected line. Prices are at 59s. 9d. for 10 ozs. 40 ins., and at 44s. 3d. for 7½ ozs. with 11 ozs. 45 ins. at 65s. 9d. per 100 yards f.o.b. Calcutta for April shipment, and at 58s. 8d., 44s. and 65s., respectively, May. B twills have fluctuated within fairly narrow limits to become 140s. for April and 141s. May.

During the latter half of March and the beginning of April demand for yarns and cloth in Dundee was at a fairly low level. Most consumers were remaining out of the market until the contents of the budget were known. However, spinners and manufacturers were quite comfortably placed with previous orders and output remained at a high level. Future prospects are quite good and although the time of year is approaching which is normally quiet there is no reason to expect any drop in production. Practically no stocks of finished goods are being held by manufacturers which is a very satisfactory position for the industry.

Silk and Man-Made Fibres and Cloths

Business continues at an unsatisfactory level but on the whole is slightly better than it has been for some time. The off-take of rayon filament and staple and other man-made fibres leaves much to be desired although in Lancashire interest increases in blends of the newer fibres for dress and shirt fabrics. Shirtings are selling fairly well in "Terylene"/cotton blends, also rayon shirtings with drip-dry finishes which are now competing with the all-cotton drip-dry shirt. Crease resist dress fabrics, in both rayon and cotton, have had rather better support. Interest in furnishing fabrics remains rather poor for the time of the year.

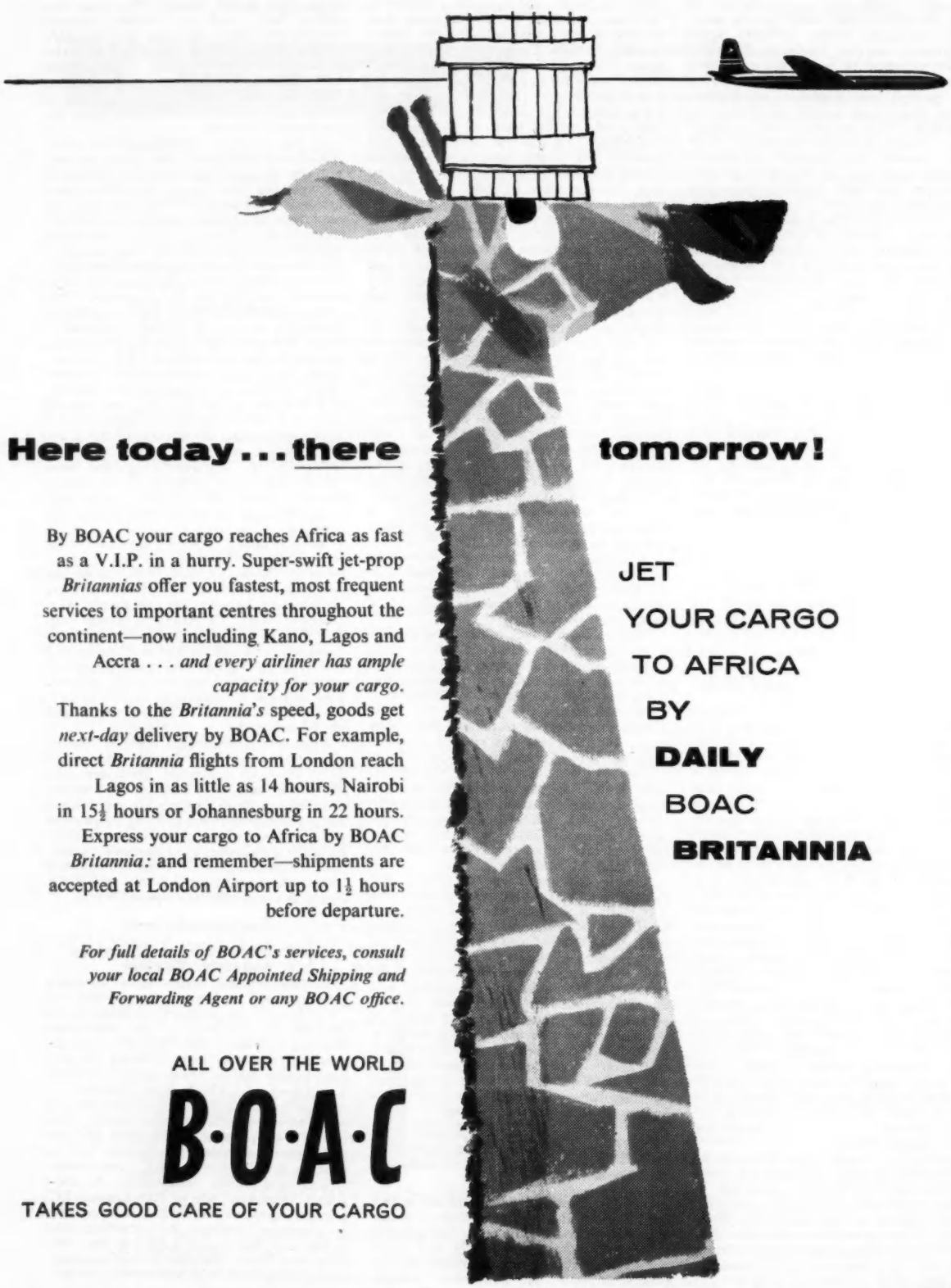
In the knitwear sections of the trade man-made fibres continue to find outlets but the sluggish movement is adversely affected by the severe overseas competition. German and Italian spinners and manufacturers have firmly established themselves in Europe, and some of their exports are badly felt in this country. Fully-fashioned hose manufacturers report increasing competition, especially from the seam-free section of the industry. The American trend for seam-free is certainly increasing steadily in Britain. Similarly, as far as knitted garments are concerned, the production of warp-knit fabrics continues steadily. It continues to dominate many sections of the underwear market, in preference to circular knit, and reports indicate a spread of warp-knit garments into men's underwear. Rayon and all-nylon are fibres which are widely used, with an expansion of "Terylene" into the field rather noticeably. In the half-hose manufacture, nylon and "Terylene' have captured a large part of this substantial market.

In Yorkshire circles new knitwear factories have appeared and this is of no little significance in view of developments that have taken place in Lancashire. Demand for the newer fibres is steady, with "Acrilan" and "Terylene" in blends with wool selling very well. For ladies' suitings, there is a good call for blends of rayon and wool and all rayon, and most classes of worsteds and woollens are in fair request. The demand for yarns for tufted carpets continues especially in viscose rayon and wool blends.

Leek and Macclesfield trade is steady; the demand for bulked yarns appears to have steadied and most throwsters are fairly well employed. Roller and screen printers are quiet but among the fabrics being printed there is a growing proportion of "Terylene" cloth. Smallwares sections are quiet with orders of a spasmodic nature. Autumn bookings for knitwear are reported better than a year ago. A bright spot is the steady demand for double-jersey fabric.

New Product Improves "Terylene" and Nylon Dyeings

Lissolamine RC, a new I.C.I. auxiliary product, will improve the dyeing of "Terylene." Its primary function is to increase the efficiency of the reduction-clearing treatment following the application of disperse dyes. Being liquid, Lissolamine RC is more convenient than Lissolamine A, which it is designed to replace for this application. It gives results equal to those with the latter agent. The use of 2 - 3 parts of Lissolamine RC per 1,000 parts of reduction clearing liquor, treating for ½ hour at 50°C., represents typical application conditions. A subsidiary important use of Lissolamine RC is in dyeing nylon with Nylomine dyestuffs. It promotes levelness by retarding dye uptake and the greatest benefit is observed with pale shades. Samples and information are available from I.C.I. Dyestuffs Division, Blackley, Manchester.



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Notes and News

I.R.S.F.C. President

Colonel F. T. Davies has been elected president of the International Rayon and Synthetic Fibres Committee, succeeding Mr. J. de Precigout who declined the renewal of his mandate, following on his nomination as a member of the Economic and Social Committee of the European Communities, and who was elected honorary president of I.R.S.F.C. Colonel Davies is a director of "Snia Viscosa" and several other companies.

* * *

Wool Disposals

Sales of wool from the stockpile will be resumed on a limited scale at the London auctions which begin on May 27. Further limited sales will be made at an even rate during the remainder of the year ending March 31, 1960. Sales will, as in the past, be carried out by the British Wool Federation.

Exemption from A.T.I. Part 1 Examination

The Council of the Institute has accepted the Associateship of the Royal College of Science and Technology, Glasgow (A.R.C.S.T.) as an exempting qualification from the whole of the Part 1 Examination leading to the award of the Associateship of the Institute. Exemption is granted only if the applicants have satisfied the preliminary educational requirements of the Institute either before the commencement of their course, or in the first year of a four-year course.

* * *

Change of Address

Ransome and Marles Bearing Co. have moved their London office to new and larger premises at Cranmer House, 39 Brixton Road, S.W.9.

The 1959 Marburg Lecture

Dr. H. F. Mark (director, Polymer Research Institute of the Polytechnic Institute of Brooklyn) will present the annual Edgar Marburg lecture at the 62nd annual meeting of the American Society for Testing Materials at Chalfonte Haddon Hall, Atlantic City, on June 23. This annual lecture, a memorial to the first secretary of ASTM, was established to emphasize the importance of furthering the knowledge of properties and testing of engineering materials. During the last few years, new catalytic systems have been discovered and new methods of polymerization developed which permit the preparation of many organic polymers with a much higher degree of molecular regularity than has been possible hitherto. Some of these new materials have already found interesting and meaningful applications. Others are just now being investigated in respect to their most profitable and promising uses.

* * *

Trends in Design Training

Addressing the recent annual meeting of the Lancashire Section of the Textile Teachers' Association, at Burnley, Mr. H. Wild (head, Design Section of the British Man-made Fibres Federation) appealed for closer co-operation between the manufacturing industries and the design teaching centres. Help from industry was essential in order to make the efforts of the educationalists more effective. "The trained designer should keep abreast of public demand, studying the ever changing preferences and reactions of people and translating his ideas into designs which will work, not only from the view of economy and maintenance, but also from the point of view of trend," said Mr. Wild. Designers, he said, had to be sensitive to what the consumer wanted or would want a year or two hence, and at the same time needed to be trained how to achieve this through the methods of production of the particular industry which he served. The idea that fashion was imposed on women by a small number of individuals working in Paris was a misconception. Fashion arose from ideas presented to women by clever designers, whose cleverness consisted of their ability to develop with remarkable swiftness the particular ideas women took to.

* * *

Wool Textile Research Conference

Arrangements are in hand for the second International Wool Textile Research Conference, which the Textile Institute is organising with financial assistance from the International Wool Secretariat, the Wool Textile Research Council and other organisations connected with the industry. This conference in Harrogate in May, 1960, will be followed by the Institute's annual conference in London, which will mark the jubilee of the Institute.

New Inflatable "Airhouse"

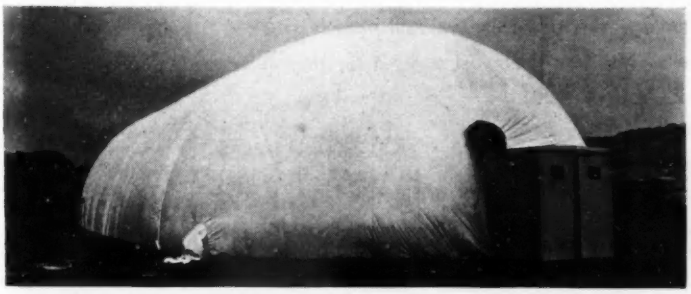
AN inflatable Airhouse made of synthetic fabric coated with Geon PVC has been put on the market by Gourock Ropework Co. Ltd., Glasgow, Scotland. Erection of the airhouse—which resembles a giant igloo—is simple: the deflated house is laid out in sections which are then laced together, the base ring of the house being secured by pegging it down or securing it by special fasteners. It is then inflated by air blown in at a low pressure through a fan. In a matter of minutes the house is fully extended. The fan is kept running—at a cost of 1d./hour—and the airhouse remains erect because of the pressure differential between inner and outer surfaces.

This new idea offers swift cover and protection in a portable, inexpensive form. The airhouse is provided with normal sized doorways and it is easily handled and can be erected in the minimum of time. Rotproof, its tough Geon PVC coating enables it to withstand rough treatment. No added illumination is required in daytime since, surprisingly, the light intensity inside the airhouse is normally higher than outside. The following cloths from the "PluViaC" range are normally used for airhouse construction:—

Cloth	Loom-state per sq. yd.	Proofed weight per sq. yd.
05WNFX (nylon base)	4¾ ozs.	16 - 17 ozs.
05WTFX ("Terylene" base)	4¾ ozs.	16 - 17 ozs.

Both nylon and "Terylene" PVC-coated cloths combine tremendous toughness and durability with remarkably high tear-strength and lightness in weight. If specially required, any of the cloths can be fire-proofed without affecting other properties.

The airhouses, which can be supplied in almost any size by joining together standard sections, have many applications, e.g. in building construction or for storage and the like.



Inflation completed. Note the spare air-trunk at the bottom left corner of the airhouse. This is provided to accommodate a stand-by fan unit or for very rapid inflation

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NEW 'THAMES' WHITE DUPLEX BOARD

MORE cartons to the ton! A bright white surface! That's what your boxmaker gets from the new "THAMES" White Duplex Board. This 100% pulpboard will really be talked about for its quality, its yield, and the way the colours live on its fine printing surface. "THAMES" research and manufacturing experts have worked hard for you and your boxmaker. Specify "THAMES" White Duplex board and see the improvement in your packs.

Your boxmaker can get details quickly from

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"Orlon" Plush Knit Fabric

A new knit fabric of "Orlon" acrylic fibre, velvet-soft and deep as plush, is announced by E. I. Du Pont De Nemours. The luxurious texture of this napped and sheared interlock fabric is said to remain essentially unchanged even after numerous launderings—with garments staying true to shape and size. Because of its pliant quality yet firmness of body, the plush knit offers extensive possibilities in designing sweaters. For instance, styles now available in beautiful pastels and vibrant colours include easy-cut cardigans, pullovers with big collars that tie or that drape softly in cowl effect, smart blousons, and scoop-necked evening sweaters. In addition to sweaters, other uses of the plush knit will ultimately include sportswear, dresswear, robes, and sleepwear.

* * *

Quality Control

The formation of a Quality Control Group of the Textile Institute will come into being officially on November 10 at Harrogate. The inauguration of the group will be a one-day conference on this vital subject. Meantime arrangements are in the hands of an *ad hoc* committtee, and the convenor is Mr. L. H. C. Tippett, M.Sc. (British Cotton Industry Research Association). The inaugural meeting and conference of the Physics Group of the Institute will be held at Buxton, October 8 and 9. The convenor and chairman of the *ad hoc* committee, is Dr. H. O. Puls, B.Sc., F.Inst.P. (British Nylon Spinners Ltd., Pontypool).

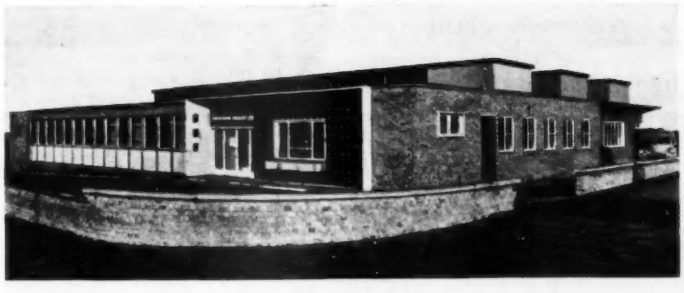
This new creel in the Nottingham factory of Robert Shaw Ltd. is made of Dexion 225, Dexion 140 and punched strip

Dexion used for Warping Creels

NEW warping creels made almost entirely of Dexion slotted angle have recently been installed at the Nottingham cotton and nylon hosiery factory of Robert Shaw Ltd. Made of Dexion 225, Dexion 140 and Dexion punched strap, the only non-Dexion components were the eyelets. In addition to this application Dexion has solved storage space problems for the same firm. They recently installed a new type of "mobile storage unit" made entirely of Dexion. Banks of Dexion shelving units run on special track-castors (supplied by Ingold-Compactus) and "concertina" together, thereby eliminating the necessity for permanent gangways between units. Materials used: 2,331 ft. of Dexion 225; 1,400 ft. of Dexion 140; 220 ft. of Dexion punched strap; 120 ft. of Ingold-Compactus track and 42 castors.

Veeder-Root Expansion

VEEDER-ROOT LTD. have embarked upon an expansionist policy which entails enlarging their Dundee factory and moving their headquarters from Purley Way, Croydon, to larger premises at New Addington, Croydon, Surrey, shown here. Apart from being the head office, the new premises will house general administration, home and overseas sales divisions, and research departments to cover mechanical, electric and electronic counting and computing devices. In conjunction with their American associates this progress, it is stated, will make the Veeder-Root organisation the largest of its type in the Western hemisphere.



The new premises of Veeder-Root Ltd. at New Addington, Croydon, Surrey

New Reactive Blue

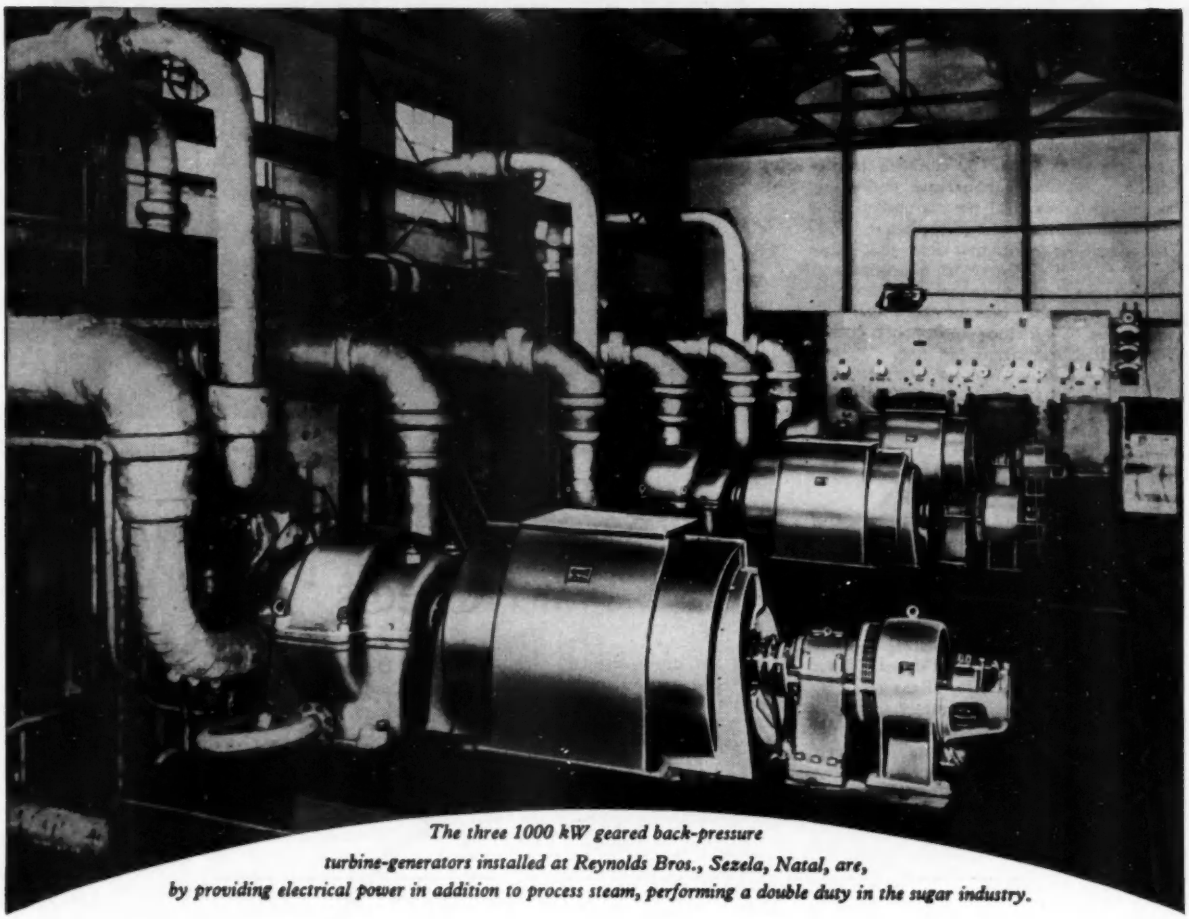
Procion Brilliant Blue HGR—a new addition to I.C.I. Dyestuffs Division's range of Procion reactive dyestuffs—is a bright reddish-blue that gives attractive shades of good washing fastness and excellent light fastness. Of particular value in the textile printing, its very good solubility and printing paste stability commend it and it is superior in these respects to Procion Brilliant Blue RS, which it resembles in shade. The new dye increases the range of shades obtainable from "H"-type Procions on cellulosic fibres, chlorinated wool and natural silk. It is applied by the established procedure for "H"-type Procions.

* * *

Theme for Power Convention

"Electricity and Its Contribution of the Standard of Living" is to be the theme of the eleventh British Electrical Power Convention which is to be held in Torquay, June 1 to 5, under the presidency of Mr. C. R. King, C.B.E., Comp.I.E.E., M.Inst.F., deputy chairman, Central Electricity Generating Board. As in former years there will be an electrical exhibition associated with the convention.

Geared Back-Pressure Turbines–



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

–cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

Please write for further details

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RECENT TEXTILE PATENTS

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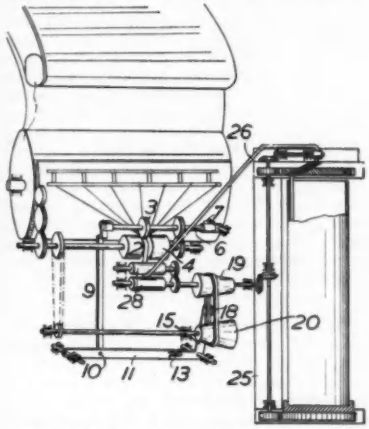
794,445 Maintaining Uniform Card Sliver

W. ALTENBURGER, *Sonnenbergstrasse, Turbenthal, Switzerland.*

A device in carding machines which permits the production of a sliver of uniform thickness. Variation in thickness of the sliver 26 passing through the groove 4 of roller 2 will deflect roller 3 due to its pivoting arrangement on bolt 7 together with its associated shaft 6. Consequently roller 3 will rise as the thickness of the sliver increases and will be lowered, as the thickness decreases. Due to this radial movement of roller 3, shaft 6 will be pivoted thus transmitting its movement by rod 9, bolt 10, bar 11 and pin 13 to the two-arm lever 15. Due to the pivoting movement of lever 15 the belt 18 will be displaced on the transmission rollers 19 and 20, causing a corresponding adjustment of the speed of roller 19. Consequently, the

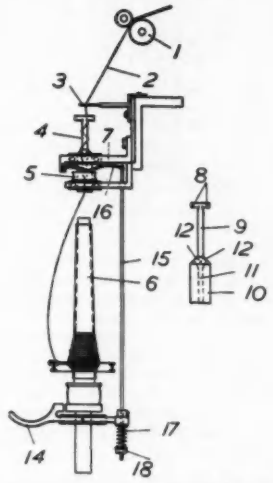


speed of the drawing rollers 28 and of the rotating members of the sliver can 25 will be adjusted accordingly. Since the speed of delivery of the sliver from the carding machine 1 and the speed of rollers 2, 3 will always remain constant a variation of the speed of drawing rollers 28 will cause a drawing-off of the sliver between rollers 2, 3 and rollers 28 corresponding to the movement of roller 3. The rollers 28 are driven such that with a sliver of uniform thickness passing between rollers 3 and 4 a drawing effect will always be present. Thus if the thickness of the sliver decreases, the drawing effect of rollers 28 will be decreased. The speed of the sliver can is varied to ensure that no drawing effect will be produced at the delivery rollers 34 due to undesired variations in speed of rotation with respect to the rollers 28.

794,449 Reducing Yarn Breaks in Ring Spinning

J. SUTTER *Raddon (Haute-Saône), France.*

Improvement on ring frames whereby yarn breakages can be kept to a minimum. The yarn 2 issues through drawing rollers 1 and runs through a guide 3 to a twisting element 4 which is driven by a pulley 5 at a speed slightly higher than the main spindle 6. The element 4 is mounted on a bed 7 of the frame and comprises a member 9 having two short projections 8 at its upper end. An enlarged extension 10 of the member 9 has a bore 11 which



branches into two inclined holes 12. The yarn coming from guide 3 is laid around the member 9 at least one turn and then proceeds through one of the holes 12 into the bore 11 and thus leaves the twisting element. A mutual braking mechanism may be provided to stop both the twisting element and the main spindle. A brake 14 for the spindle is connected to a friction disc 16 for the twisting element by a rod 15, the disc acting on the pulley 5. Correct adjustment of the braking mechanism can be effected by a nut 18, acting on a compression spring 17. By means of the twisting element the yarn is completely twisted at its upper portion so that the main spindle merely has to wind the yarn.

794,529 Securing Beam Flanges by Adjustable Clamp

A. V. H. SPINK, 2 *Holderness House, Long Close, Delph Hill, Wyke, Bradford.*

An improved form of clamping means for beams which is of cheap and simple construction. A bush is secured to the flange, with a radially contractible collar device housed in it, and having a roughened internal surface which encircles and grips the barrel. Preferably there is a roughened surface extending over a desired length of the barrel and upon which the collar can be clamped by screws or clamping means.

794,904 Improved Burling Irons

T. KERSHAW, 102 *Cooper Lane, Horton Bank Top, Bradford,* and J. H. KERSHAW.

Means for rubbing cloth after burling has taken place, comprises a pad of rubber, or similar resilient material which is provided with a recess, which is elongated in cross-section, for mounting the pad on a support.

795,133 Flame-Proofing Viscose Products

R. S. ROBE, *Montclair Golf Club, Montclair, New Jersey, U.S.A.*

Relates to the flame-proofing of viscose rayon, etc. The process comprises producing a regenerated viscose cellulose product containing reactive cellulose material having a reactive substituent group of carboxy methyl, glycerol ether or carboxy ethyl. The reactive group is present in amount providing reactive cellulose as only a minor part of the cellulose content of the product. Introduced into the product (which has not been subjected to any substantial drying) is a compound of a metal which has flame-proofing properties and which is adapted to react with the reactive group. The compound is then reacted with the group to produce an insoluble compound of the metal embodied within the cellulose product.

795,313 Improved Driving on Blamires Feeds

CLIFFE AND CO. LTD., *Longroyd Bridge, Huddersfield.*

Improved driving means for the lower lattice of a "Blamires" feed machine, which will enable the machine to operate more efficiently. The lower lattice is driven continuously in its direction of feed by an electric motor mounted on the frame, the motor driving lattice through reduction gearing and change speed gearing.

795,374 Improved Dropper Jacquard Mechanism

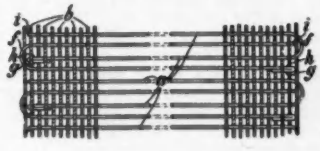
JOHN JARDINE LTD., *Chelsea Street, Nottingham*

Dropper jacquard mechanism in which droppers are selectively projected into operative position by advance movement of a jacquard cylinder and are returned after return of the cylinder. Means for controlling each projection and return of the droppers comprises a stop to limit the projection, a return spring to effect the return, and a releasable detent to temporarily delay the return.

795,468 Selvedge Forming on Shuttleless Looms

WEAVING RESEARCH AND TEXTILE COMMISSION AGENTS LTD., *Ballamoar Castle, Jurby, Isle of Man.*

An improved fabric from a shuttleless loom having more weft in the selvedge than in the body of the cloth. Each thread *a* is of U form, being looped back at *f* in the



opposite selvedge to that containing the ends of the loop. One end *h* of each loop has a turned back length *g* which is bound in the fabric in the same warp shed as *h*. At the left hand selvedge, the ends *h* with the turned back portions *g* come within the looped portions *f* of threads, whilst at the right hand selvedge, the plain ends *i* come within the looped portions *f*. The plain ends *i* at the left hand selvedge come between adjacent looped portions *f*; the ends *h* with turned back portions *g* at the right hand selvedge come between adjacent looped portions *f*. The four warp threads nearest to each selvedge are crossed over at alternate weft picks but the other warp threads are crossed over after each weft pick.

795,485 Improved Bobbin for Centrifugal Spinning

PATONS AND BALDWINS LTD., *Darlington, Durham.*

An improved form of bobbin for doffing of spun yarn from the centrifugal pot of a worsted yarn spinning machine. A tapered bobbin made of toughened plastic is mounted upon an aluminium or like base. The smaller diameter end of the bobbin is formed with longitudinal splits which, due to the pliable nature of the material permit the expansion of the bobbin end sufficient to take up the slackness in the doffed yarn at this part of the bobbin and facilitate subsequent winding processes.

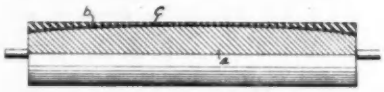
795,523 Improved Pressure Rollers

BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester.*

Describes improved pressure rollers, comprising a non-resilient supporting core journaled by its ends and carrying a resilient cover. In the example shown, the mangle roller bowl face measures 42 ins. long by 8 ins. diameter. It has a hard steel core *a*, on the top of which is a hard vulcanite R.T.M. covering *b* of about $\frac{1}{8}$ in. thickness and an outer resilient rubber cover *c*. The cover *b* has a uniform radial thickness but the steel core *a* is barrel-shaped to give a circular curvature to the periphery in the length of the roller. The diameter of the steel core from the centre, measured at 6-in. intervals is as follows:—

18	12	6	Centre	6	12	18
$5\frac{7}{8}$	$6\frac{1}{8}$	$7\frac{3}{32}$	$7\frac{1}{4}$	$7\frac{3}{32}$	$6\frac{1}{8}$	$5\frac{7}{8}$ ins.

With a hard vulcanite R.T.M. covering of $\frac{1}{8}$ in. thickness and a flexible rubber

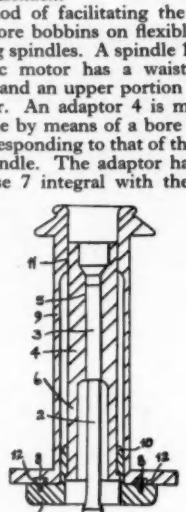


covering having a Young's Modulus of 2,000 lb./sq. in. giving an overall unloaded diameter of 8 ins. it is calculated that uniform pressures will obtain when the total pressure load on the roller axle is 4,500 lbs. With any variation of pressure from this, the higher compression rating at the centre compared with the ends will compensate for variation of bowing of the core and complementary roller, and the pressure gradient which obtains is therefore relatively flattened compared with that which would obtain with a soft roller having a uniform diameter of core and thickness of resilient covering.

795,531 Spindle Mount for Large Bore Bobbins

COURTAULDS LTD., 16 *St. Martin's-le-Grand, London.*

A method of facilitating the mounting of large bore bobbins on flexible spinning or twisting spindles. A spindle 1 driven by an electric motor has a waisted middle portion 2 and an upper portion 3 having a slow taper. An adaptor 4 is mounted on the spindle by means of a bore 5 having a taper corresponding to that of the portion 3 of the spindle. The adaptor has a skirt 6 and a base 7 integral with the skirt and

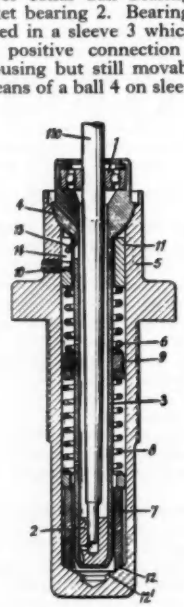


studs 8 project from the base. There is a substantial clearance between the lower parts of the adaptor and spindle and the lower part of the adaptor is not held by the spindle. A bobbin 9 fits on to the adaptor and is held by a close fit at its upper and lower ends 10, 11 and by the studs 8 fitted into recesses 12 in the base of the bobbin. The centre of gravity of the bobbin and adaptor lies approximately at the upper end of the skirt.

795,569 Flexible Spindle Mounting

WUERTT, SPINDELFABRIK G.M.B.H., *Suessen, Germany.*

A spindle mounting for stabilising the operation of the spindle and for permitting the spindle to align itself. The spindle 120 is mounted in a spindle housing 5 by means of an upper collar ball bearing 1 and a lower socket bearing 2. Bearings 1 and 2 are mounted in a sleeve 3 which is maintained in positive connection with the spindle housing but still movable relative to it by means of a ball 4 on sleeve 3 which



is pivotable in a socket at the outer end of the housing, and a strong coil 6 which tends to draw sleeve 3 into the housing. Spring 6 rests upon a connecting sleeve 11 which is retained in housing 5 by a set-screw 10, and acts upon a ring 9 which is screwed to sleeve 3 and also supports a second weaker spring 8 which acts upon a stabilising bushing 7 around the inner end of sleeve 3. Bearing 2 is secured in the end of sleeve 3 which is guided with a small radial play within the stabilising bushing 7, while the latter is mounted with considerable radial play in the inner end of housing 5 and maintained centrally in it through the conical surface 12 which is forced by spring 8 upon its corresponding conical seat 12' at the inner end of housing 5. After loosening set screw 10, sleeve 3, bearings 1 and 2, sleeve 11, and spring 6 may be easily removed from the spindle housing, whereupon spring 8 and sleeve 7 may also be withdrawn. A projecting lug 13 on sleeve 3 engages into a slot 14 of sleeve 11 to prevent sleeve 3 from rotating relative to housing 5.

795,615 Filament Measuring Device

HOSIERY AND ALLIED TRADES RESEARCH ASSOCIATION, *Sherwood Rise, Nottingham.*

Relates to filament measuring devices, primarily for the measuring of speed or length of yarn running to a knitting machine. The device which translates linear travel of a running filament into rotary movement representative of the filament speed or length, comprises two co-operating light weight rotary and intermeshing vane wheels mounted to engage the running filament between them and to be driven by the filament. The wheels are so constructed that the filament is engaged solely by the outer edges of the intercalating vanes and is kinked by them. The vanes of each wheel are preferably formed with side edges so inclined that the side edges of overlapping vanes form, when viewed in elevation, a convergent and preferably V-shaped notch.

795,676 Improved Drafting System

SKF, 13 *Ernst Sachs strasse, Schweinfurt am Main, Germany.*

A method of drafting slivers in which at least half of the fibres are of the same order of length, and which length is known. For one of the drafting rollers in a co-operating pair, a diameter is chosen that has a circumference which is either equal to the

fibre length (or to the average fibre length) drafted or is equal to the fraction of the fibre length (or of the average length) obtained by dividing this length by a whole number. In the mechanism shown, 30 is a back top roller, 31 a bottom roller and 32 the nip of this pair of rollers. A bottom apron 33 passes round the bottom roller and is guided over an apron bar 34. The pair of drafting rollers consists of rollers 35 and 36 with a common nip 37 and 38 is a control roller. The circumference

of roller 35 is made equal to the length or average length of the fibres in the sliver. The circumference of the bottom roller 36 is made a multiple of the circumference of the top drafting roller.

795,890 Improved Hackling Frames and Gill Boxes

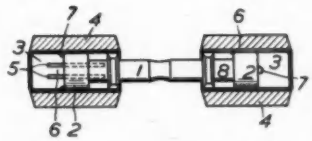
DEUTSCHER SPINNEREIMASCHINENBAU INGOLSTADT NIEDERLASSUNG DER SCHUBERT AND SALZER MASCHINENFABRIK AKTIENGESELLSCHAFT, *Ingolstadt/Donau, Germany.*

Relates to gill bars and gill bar guiding means for hackling frames and intersecting gill boxes with advance and return screws for the horizontal feed of the gill bars and with rotating lifting and lowering cams arranged at the ends of these screws, the cams having curved surfaces merging tangentially into cylindrical surfaces of the spindles of the screws. Each end of each gill bar is provided with two curved cam follower surfaces, one of which forms a continuation of the gill bar surface carrying the set of pins and co-operates with the cam surface of one cam. The other cam follower surface of the bar, facing away from the set of pins, is guided in a shock-free and mechanically positive manner by the cam surface of the other cam of the pair of co-operating screws, during the whole lowering or lifting movement of the gill bar.

796,112 Improved Roller Assembly

JOH. JACOB RIETER AND CIE, *Winterthur, Switzerland*

A roll top assembly includes a shaft 1 carrying two ball bearings 2 on to which carriers 3 for spinning coverings 4 are pushed. Two slots 5 are provided in each carrier leaving a resilient portion 6 between the slots. The slots affect additional



resiliency of the centre part of the thin-walled carrier, firmly clamping the carriers to the bearings 2 yet with a force which can be manually overcome. The covering which is pulled on to the carrier augments the clamping pressure of the carrier against the bearing. This method of fitting the carrier on the bearing prevents the carrier sliding on the bearing during normal operation of the top roll assembly. Projecting lugs 7 and bulges 8 are provided for fixing the carriers to the ball bearings in the axial direction, the bulges 8 yielding into covering 4 when the bearings are pushed into or pulled out of the carriers.

796,138 Metallizing Fabrics

HEBERLEIN AND CO., *Wattwil, St. Gallen, Switzerland.*

A method of metallizing textiles, especially those consisting of cellulosic fibres, by depositing metal from the vapour state on them in a high vacuum. After the metal has been deposited, the coated fabric is heated at a temperature exceeding 100°C. The following examples illustrate the method.

Example 1.—Cotton muslin rendered transparent with sulphuric acid and dyed black is impregnated with a polyvinyl acetate emulsion so that 4% of polyvinyl resin is deposited on the fabric. The material is then exposed in a high vacuum to aluminium vapour and then heated for 3 mins. at 160°C. in a curing machine. The deposited aluminium adheres considerably better even to the wet fabric than is the case when the heating is omitted.

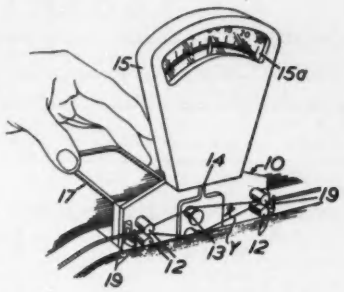
Example 2.—A green dyed viscose toile which has been rendered resistant to swelling by means of a formaldehyde treatment is impregnated with a polyvinyl butyral emulsion, then exposed in a high vacuum to the vapours of copper and then of gold, and is finally heated for 4 mins. at 180°C. The heat treatment fixes the deposited metal to such a degree that the gold deposit is enabled to withstand a mild wash with a synthetic detergent.

Example 3.—Cotton muslin rendered transparent with sulphuric acid and dyed navy blue is first exposed to cathode rays emitted by a glowing cathode in a high vacuum apparatus under a pressure of about 0·05 mm. mercury for 1 min., is then exposed in a high vacuum to aluminium vapour, and finally heated in a curing machine for 4 mins. at 220°C. The metal deposit adheres satisfactorily to the fabric.

796,159 Warp Tension Comparing Device

BRITISH RAYON RESEARCH ASSOCIATION, *Manchester.*

Describes an accurate tension comparator which is simple to manufacture and use. The device comprises a housing



10 and a pivotal member 11. The base of the housing consists of a rectangular portion 10*a* with an integral fan-like portion 10*b* extending from its longer side. Along the arcuate edge of the fan-like portion is secured a scale having the zero mark at its centre and equal graduation on either side of the zero. Adjacent to each of the shorter sides of portion 10*a* is a pair of guide rollers 12. At the same side of the housing, pivoted at its centre of gravity and directly below the zero mark of the scale is the member 11 which has on its face two pulleys 13. Secured to the other face of the pivotal member is a pointer 14. The disposition of rollers 12 and pulleys 13 is such that when the member 11 is disposed along the portion 10*a*, the pairs of rollers and pulleys are symmetrically disposed with reference to a horizontal line passing through the centre of gravity of the pivotal member, the pointer 14 then indicating zero on the scale. Secured to the rear of the housing is a horizontal U-shaped rod 17 which is adapted to be rested on a surface, or on threads adjacent to the threads being tested. In using the device to compare the tensions in a pair of warp threads two warp threads X, Y may be passed between the pairs of rollers 12, and respectively over the upper pulley 13 and beneath the lower pulley 13. The resultant deflexion (if any) can then be read off from the scale. If no deflexion of the pointer occurs then the tensions of each thread are equal but should the pointer be deflected to the right of zero this would indicate a higher tension in the thread on the bottom pulley whilst deflexion to the left would indicate higher tension in the thread on the top pulley.

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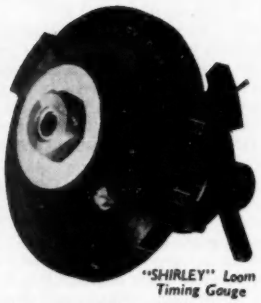

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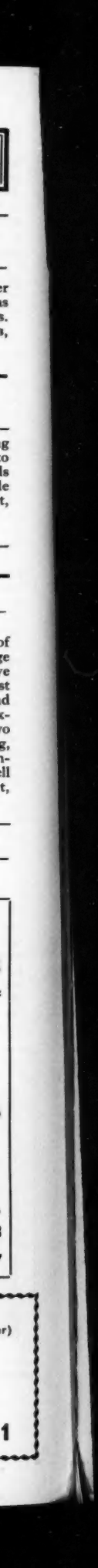
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